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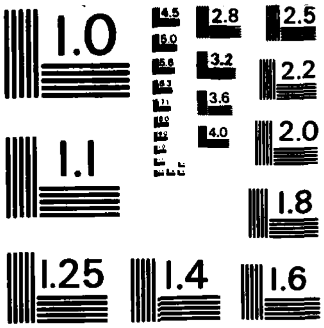

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TEST PLANNING, COLLECTION AND ANALYSIS OF PRESSURE DATA RESULTING FROM WEAPON SYSTEMS

Final Report

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October 1981

Supported by
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Fort Detrick
Frederick, MD 21701

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

JAYCOR determined that much of the pressure trace detail from the M-198 155mm howitzer with the M203 charge could be understood in terms of gas dynamics and the gun and ground geometry. The objective was to determine the feasibility of simulating the far field muzzle blast and to interpret the field data already taken. A lung model was also developed which gives a way of comparing various pressure traces in terms of the internal dynamics. The agreement seen between measured and predicted pressure traces is repeated in the lung response. A biomechanical workshop was also held in Albuquerque, New Mexico on lung modeling.

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CONTENTS

1. INTRODUCTION

This report documents tasks performed by JAYCOR from the period June 1980 until October 1981 to develop a biomechanical understanding of the processes involved in air blast injury. The thrust of the work has been not only to carry out specific tasks but to evaluate existing technology, test and digest alternate approaches, and formulate an overall plan for accomplishing the mission of the Blast Overpressure Program. In the course of carrying out both the spirit and the letter of the program objectives, we have investigated a wide range of phenomena and technology that had been previously unknown or not applied in the biomechanical field. The results have been encouraging and have allowed the Walter Reed Army Institute of Research (WRAIR) to be able to formulate a long-term research program to quantify the processes and develop new damage risk criteria.

The project during this period of time consisted of three contract phases reflecting the changing and increasing knowledge about the mechanics of air blast injury. With each modification, new directions that had been explored in the previous work that proved promising were called out for more detailed investigation, while approaches that had been superseded or found to be unnecessary were dropped. Consequently, varying amount of work was done on each task depending on the viability of the approach taken. In doing this exploratory development, close contact was kept with WRAIR and the decisions to change the level of effort on the major tasks was done with their knowledge and direction. The result has been a highly flexible and effective working arrangement between sponsor and contractor that is vital to a scientific investigation in an area where all of the technical issues have not been clearly identified.

This report documents many of the details of the work during the period of performance grouped by their scientifically logical order. There are four main parts, Sections 2, 3, 4, and 5, that address in causal order the propagation of the blast wave, the interaction with a body shape, the state of understanding of the biomechanics of the thorax, and finite representations of the biomechanical dynamics. This framework contains the building blocks upon

which future long-term research to develop and validate a damage risk criteria for air blast exposure will be built.

Contractually, the tasks were defined during the course of the work and reflected the current understanding of the problem and therefore included work which was later decided to be expanded upon or significantly reduced. The following is a list of those tasks and a brief summary of the work performed on each. There were a total of eight tasks over the contract period, and they have been renumbered for simplicity but appear in the same order as the three contract modifications.

Task 1 - Blast Field Interpolation

The BLAST Code was used to interpolate to all points in the field the data collected from M198 firings. The intention was to validate the calculation and highlight worst case pressures distributions around the weapon. The comparisons were carried out in detail and displayed in Section 2.1. A special contour graphic package was developed for displaying the output of the computer code at all spacial locations for quantities of interest such as peak overpressure, A-duration, and A-impulse. Static as well as dynamic pressures were determined to assess the influence of the winds generated by the explosions. The results were presented to WRAIR in an interim progress report.

Task 2 - Similarity of Blast From Various Sources

The purpose of this task was to evaluate the feasibility of using the BLAST Code to simulate blasts from sources other than the gun. In particular, from a shock tube and bare charges. At the time the task was written, it was uncertain what would be the best source of blast waves for conducting systematic testing. The impetus for this comparison was diminished when the programmatic decision was made to go with an impactor in a laboratory environment as providing the best facilities for conducting the medical research. JAYCOR did, however, determine that the BLAST Code would be applicable to bare charges in a straightforward modification of the present version and to a shock tube when calibrated as for the weapon itself. The bare charge feature was implemented as an option to the code and a description of its use and results is contained in Section 2.3.

Task 3 - Literature Search on Biomechanical Aspects

JAYCOR had already begun a literature search on its own into lung and chest models and this task extended that search to include data bases and the thorax region as well as searching for lung injury mechanisms directly. The literature searches turned up almost 400 citations which were relevant to the overall problem, and these citations were further investigated and 50-some references extremely pertinent to the mission of the blast overpressure program were obtained and delivered to WRAIR. In addition, the complete work of Clemedson on the subject was collected and delivered in a bound volume. The results of that search are described in Section 4.1, and Appendices A and B contain the citations.

Task 4 - Conduct a Workshop on Biomechanical Modeling

Based on the literature search, discussions with leading experts in the biomechanical modeling field, and analysis by the blast overpressure program manager, it was decided to have the experts meet in a workshop environment in Albuquerque during December 1980. JAYCOR organized and hosted the workshop and supplied support services as well as honoraria to the guests. Tape recordings and extensive notes were taken of the sessions, and after the workshop a synoptic report on the presentations and conclusions was prepared. That material and the description of the activities is contained in Section 4.2.

Task 5 - Develop an Three-Dimensional Finite Element Representation of Appropriate Body Shapes

This task was set before the workshop was held and was intended to begin the process of building a finite representation of the body for both external fluid dynamics calculations and internal body structural calculations. The task would draw from JAYCOR's experience in both finite difference and finite element modeling. As a result of the workshop, however, existing modeling of the structural aspects were revealed and it was the consensus of both WRAIR and JAYCOR that two-dimensional models of thorax cross section should be investigated first. JAYCOR therefore acquired the computer programs that were relevant to this task and began adapting them to the blast overpressure mission. We also implemented the existing lump parameter models with an accurate solution technique into a convenient computer program which was delivered to

WRAIR for its in-house use. Furthermore, in discussions with Professor Fung at the University of California, San Diego, it became clear that lung damage mechanisms may be governed by wave propagation phenomena within the lung parenchyma. Therefore, JAYCOR's SPUNG Code was adapted to a body-lung configuration and scoping studies made on the feasibility of following the detailed wave motion. The results of the scoping studies are contained in Section 5 and have proven to be important in focusing the effort of the long-range blast overpressure program.

Task 6 - Further Far Field Analysis

As a result of the interim report on interpolating the M198 blast field, WRAIR personnel identify apparent inconsistencies in some far field values of A-impulse. The calculations were reviewed and it was discovered that calibration based on initial peak overpressure was subject to considerable error because of the noisiness of the signal. In several cases, we had chosen an overly large value at nearby points for calibration which invalidated the far field results. At WRAIR's suggestion, new calculations were made based on calibrating on A-impulse, an integral quantity that is expected to be less sensitive to the signal noise. That method of calibration has indeed proved to be effective and the comparisons are shown in Section 2.1. We now are able to reproduce not only the qualitative nature of the pressure signal but the quantitative variation with distance from the source of A-duration, A-impulse, and peak maximum pressure.

Task 7 - Near Field Blast Modeling

The purpose of this task was to make detailed calculations of the loading on a two-dimensional object placed in a blast field and to prepare a protocol for carrying out testing that would validate the results. Three shapes were identified, ellipse, square, and circle. Calculations were made for each case with a 3 psi and a 20 psi blast wave. Two orientations of the ellipse were investigated also. The results are discussed in Section 3.1.

Because of higher priority testing programs, Lovelace Research Institute which was to carry out the testing phase has been unable to make testing time

available during the current contract period. Therefore, under WRAIR's direction, we formulated a protocol and preliminary design of a test target. The protocol is found in Section 3.2, but the experiment will have to be carried out later in FY 1982 at WRAIR's discretion.

Task 8 - Modeling of Body and Lung Dynamics

Because of the encouraging results shown by General Motors at the biomechanical workshop and those developed by JAYCOR under Task 5, it was decided to intensify the effort to use the existing structural analysis program called FEAP (Finite Element Analysis Program). At first it was believed that the code could be acquired and used immediately, but because of the proprietary nature of General Motors' research, JAYCOR was forced to work with the developers of the code at the University of California, Berkeley, to reconstruct the analysis. In doing so, we uncovered and solved coding problems in the program and made corrections to the material properties that had been suggested by General Motors. The effort to prepare the code for use in the blast overpressure program required more effort than had originally been expected. However, we have now overcome those difficulties and can use the program in both a static and dynamic mode. Section 5.1 describes the first analyses using FEAP and this effort is continuing in anticipation of its application in the next phase of the blast overpressure program.

In summary, the tasks performed under this contract and its modifications have scoped and developed the technologies required to assist the blast overpressure program in quantifying and validating the damage risk criteria for future weapon deployment. As was mentioned earlier, this effort has been directed toward guiding the use of technology as well as implementing it into a specific form. The availability of complete and consistent models connecting the blast source through the far field propagation to the loading on the body to the structural response, and finally to the local stress distributions within the lung is an important part of the blast overpressure program mission.

2. BLAST OVERPRESSURE FAR FIELD

2.1 THEORY OF BLAST CODE

2.1.1 Blast Wave

A blast overpressure wave is created when high pressure and temperature product gases that propel the shell leave the gun barrel. The disturbance to the atmosphere changes rapidly in amplitude and shape as it propagates. At the front of the blast wave, the pressure p and density ρ jump abruptly from their undisturbed values. Immediately after the front passes, this disturbance returns to ambient quickly and is followed by a rarefaction wave (Figure 1). The structure of the blast wave, e.g., the amplitude and the duration of both the compression and the rarefaction parts, varies according to its source strength and ambient conditions. In the standard atmosphere, an extremely strong source such as a nuclear explosion will generate a strong blast wave, characterized by a shock front and a very shallow rarefaction tail. On the other hand, a weak source will generate a sound wave whose amplitude and the duration are equal for the compression and the rarefaction parts of the wave. A blast wave with source strength between these two extreme cases will have a wave form of mixed type. The variation of the wave form with the source strength is indicated schematically in Figure 2.

The most appropriate mathematical treatment of the waves also varies with the strength of the source. Since sound waves are weak disturbances, the perturbation to the flow variables, p', ρ' and u', are small quantities, with the perturbation to entropy, s', being three orders of magnitude smaller [Ref. 1]. Therefore, the entropy of the sound waves is essentially constant. The governing equations can be linearized by dropping higher order terms and reduce to a simple wave equation. The technique for solving this equation can be found in standard textbooks (such as Ref. 2).

To study the opposite extreme of large source strength, the concept of similarity was introduced independently by Sedov [1946, Ref. 3] and Taylor [1950, Ref. 4]. The concept has been used in other branches of fluid dynamics,

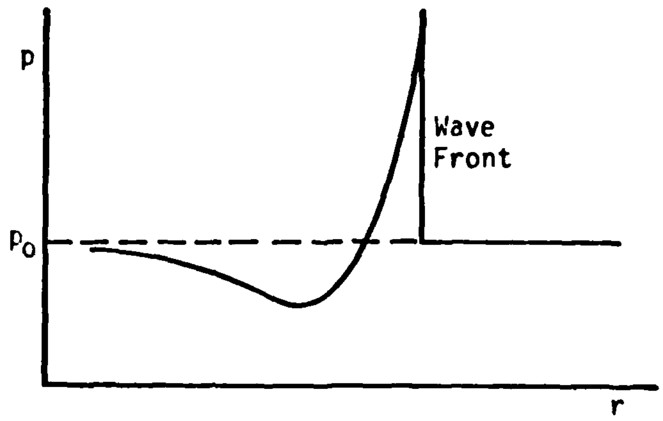


Figure 1. Spatial Pressure Distribution in Blast Wave.

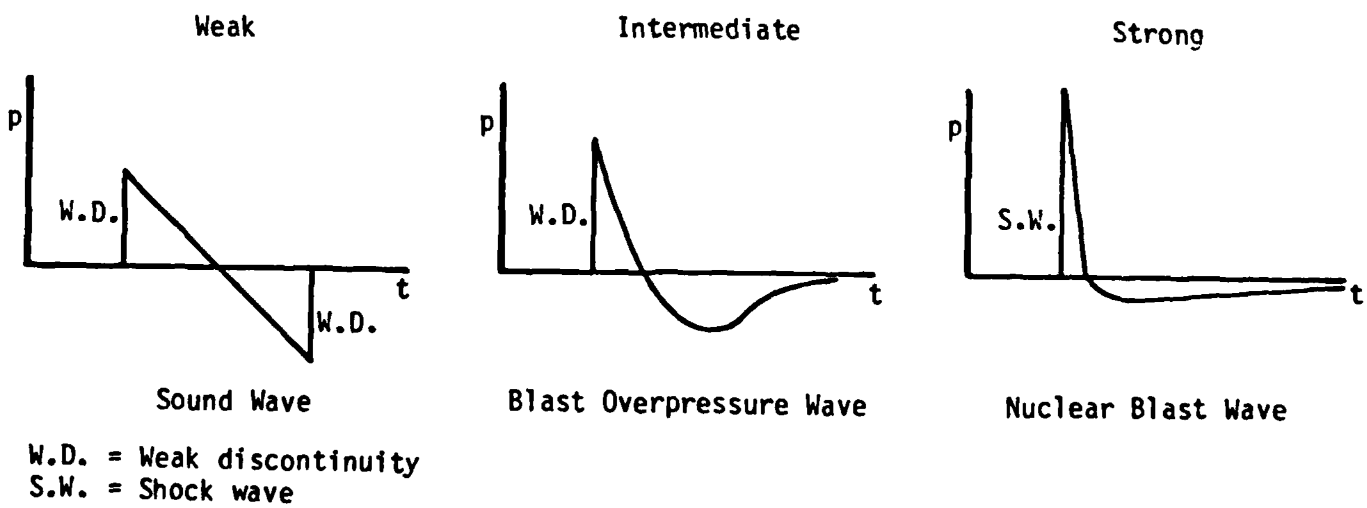


Figure 2. Pressure Trace Variation with Source Strength.

such as boundary layer theory, conical flow theory, and transonic and hypersonic flow theory. The assumption of similarity decreases the number of independent variables and often reduces the governing partial differential equations to more manageable ordinary differential equations. The technique has been very successful in analyzing strong blasts.

For blast waves with intermediate source strength, numerical methods have to be employed to solve the hyperbolic gasdynamics equations and one of the best is the method of characteristics. The distinguishing property of the hyperbolic equations is the existence of certain special directions or lines in the r-t plane called characteristics (see Ref. 5). Along the characteristics, the dependent variables satisfy certain equations known as compatibility relations. Solution of the compatibility relations generates the space-time history of blast wave, however the procedure is complicated since the characteristic lines are themselves unknowns to be determined.

The overpressure data collected for the M198 howitzer with a M-203 charge [Ref. 6] indicates that these waves are of intermediate source strength. It can be shown that for the strong blast wave the attenuation of the maximum pressure is r^{-3} while for the sound wave it is r^{-1} [Ref. 2]. A systematic analysis (Table 1) of the experimental gun overpressure data indicates that the maximum overpressure attenuates as r^{-1} to r^{-2}, indicating that the waves are of intermediate strength and requiring the use of numerical techniques. For instance, Table 1 shows the measured values of the amplitude of the incident wave and its comparison with the values obtained from the $\sim r^{-1}$ and $\sim r^{-2}$ relationships. The BLAST code which employs the method of characteristics is developed to handle blast overpressure waves typical of those generated by the M198 howitzer and similar weapons.

Table 1.

Distance Defined in Figure 1 (m)	Distance from the Muzzle Brake, r (m)	$\sim r^{-1}$ (psig)	Experimental (psig)	$\sim r^{-2}$ (psig)
10	11.44	1.41	2.50	4.98
20	20.76	0.78	1.06	1.51
30	30.51	0.53	0.71	0.71
40	40.38	0.40	0.40	0.40

2.1.2 Quasispherical Approximation

After the explosion of the charge, the shell is propelled by the high pressure and high temperature product gas, which leaves the muzzle brake as the shell is launched. Initially, the gas flow in a small region surrounding the muzzle brake is complicated by the geometries of the gun and the muzzle brake. This effect, however, becomes less significant at distances large compared to the source diameter and the wave front propagates more like a spherical wave.

In order to take advantage of the simple, near spherical structure of the blast wave at large distance, the BLAST code employs a "quasi-spherical" description. That is, along each radial line emerging from the end of the gun barrel the wave is treated as though it is part of a purely spherical wave. The intensity of the equivalent spherical wave is allowed to vary with the direction, so that the effect of the nonspherical geometry of the muzzle brake can be simulated.

In this quasi-spherical approximation, the calculation along each radial line is independent from all other radial lines. Along each radial line only a spatial coordinate, i.e., the radial distance from the source, and the time variable are involved. Thus the approximation essentially reduces a complicated three dimensional problem into a set of one dimensional problems. The method of characteristics for one dimensional gas dynamics is readily applicable.

Ground reflection is an important part of the blast waves in M198 and similar gun firings. Unfortunately the reflection of blast wave is difficult to handle both theoretically and numerically. A complete treatment of the reflection should consider the ground absorption and the nonlinear effects such as the variation of the reflection angle and the formation of the Mach stem. Such a treatment is far too complicated to be investigated in the scope of the present project.

Instead, we employ a simpler approach to the reflection problem, namely, we neglect the ground absorption and nonlinear effects and treat the reflection as perfect. The viability of this approach is borne out in the comparison with field data.

For perfect reflection, the method of image can be used. Thus the reflected wave is regarded as generated from an image source at a distance below the ground level equal to the height H of the muzzle brake (see Figure 3). The pressure wave impinging on the pressure sensor PS is then a linear superposition of the direct incident wave and the reflected wave. The quasi-spherical approximation and the method of characteristics are used both for the incident and reflected waves.

2.1.3 Propagation of Blast Wave Along a Radial Line

We choose the center of the muzzle brake as the origin of a spherical coordinate system (r, θ, ψ) shown in Figure 4. Assuming the gas is ideal, inviscid and flowing isentropically,* the equations of continuity, motion, and energy can be written:

$$\frac{\partial \rho}{\partial t} + \frac{1}{r^2}\frac{\partial(\rho u r^2)}{\partial r} + \frac{1}{r \sin\theta}\frac{\partial}{\partial\theta}(\rho v \sin\theta) + \frac{1}{r\sin\theta}\frac{\partial}{\partial\psi}(w\rho) = 0 \tag{1}$$

$$\rho\left[\frac{Du}{Dt} - \frac{v^2 + w^2}{r}\right] = -\frac{\partial p}{\partial r} \tag{2}$$

$$\rho\left[\frac{Dv}{Dt} + \frac{uv}{r} - \frac{w^2 \cot\theta}{r}\right] = -\frac{1}{r}\frac{\partial p}{\partial\theta} \tag{3}$$

$$\rho\left[\frac{Dw}{Dt} + \frac{uw}{r} + \frac{vw \cot\theta}{r}\right] = -\frac{1}{r\sin\theta}\frac{\partial p}{\partial\psi} \tag{4}$$

$$\frac{D}{Dt}[p] = a^2 \frac{D}{Dt}[\rho] \tag{5}$$

where

$$\frac{D}{Dt} \equiv \frac{\partial}{\partial t} + u\frac{\partial}{\partial r} + \frac{v}{r}\frac{\partial}{\partial\theta} + \frac{w}{r\sin\theta}\frac{\partial}{\partial\psi} .$$

*The isentropic assumption would not be valid for shock waves associated with strong blasts and the Rankine-Hugoniot shock relations would have to be employed to account for the entropy jump. The assumption is valid in the present case.

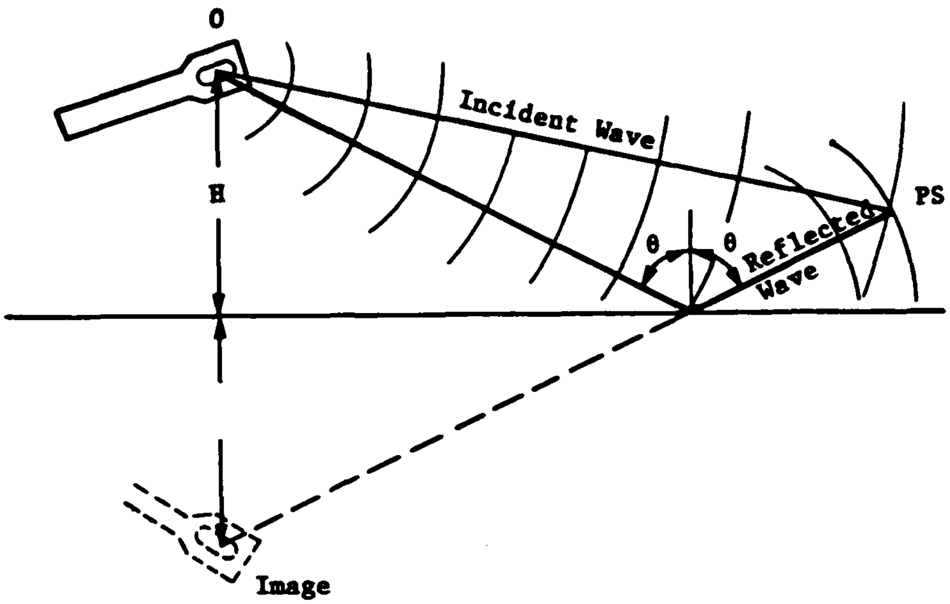


Figure 3. Method of Image.

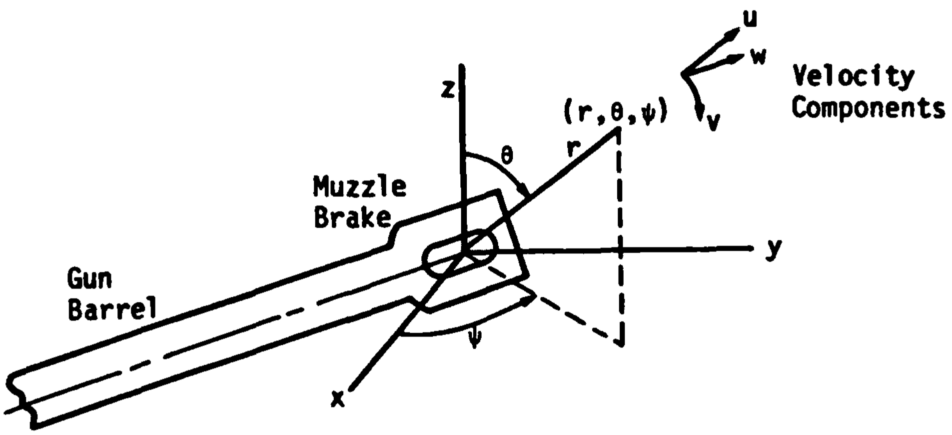


Figure 4. Spherical Coordinates with Origin at Center of Muzzle Brake.

Here u, v and w are the velocity components, p is the pressure, ρ is the density, a is the local sonic speed, and t is the time measured from the instant that the blast waves are generated.

A complete solution to Equations (1) to (5) depends on the source distribution which in turn depends on the detonation of the explosive charge and the resulting flow field in the barrel and muzzle brake. In this work we shall assume that the source distribution is known and not attempt to calculate it from more fundamental processes. In the quasi-spherical approximation employed in this work, we simulate the origin of the blast waves along each radial direction as a sphere of pressurized gas and the transport processes are important only along the radial direction although the source strength may vary slowly with θ and ψ. In this approximation, Equations (1) to (5) can be simplified as follows:

$$\rho_t + u\rho_r + \rho\, u_r + \frac{2u}{r} = 0 \quad , \tag{6}$$

$$u_t + uu_r + \frac{1}{\rho}\, p_r = 0 \quad , \tag{7}$$

$$p_t + up_r - a^2\left(\rho_t + u\rho_r\right) = 0 \quad , \tag{8}$$

where the subscript t and r denote partial differentiation.

The initial and boundary conditions are taken as

At $t = 0^-$,

$$\left.\begin{cases} p = p_s \\ \rho = \rho_s \\ a = a_s \\ u = 0 \end{cases} \quad , \qquad \text{for } r < r_o \right\} \tag{9}$$

$$\left.\begin{cases} p = p_o \\ \rho = \rho_o \\ a = a_o \\ u = 0 \end{cases} \quad , \qquad \text{for } r > r_o \right\} \tag{10}$$

where r_o = initial radius of the pressurized gas sphere and the subscripts s and o denote source and undisturbed conditions, respectively.

At $t > 0^+$,

$$u = 0 \qquad \text{at } r = 0 \tag{11}$$

Since Equations (6) to (8) are hyperbolic equations [Ref. 8], their characteristic form can be obtained in the following way. First, let us define

$$\sigma \equiv \int \frac{dp}{\rho a} \quad . \tag{12}$$

Substitution of Equation (12) into Equations (6) to (7) yields

$$\sigma_t + u\sigma_r + au_r + \frac{2au}{r} = 0 \tag{13}$$

$$u_t + uu_r + a\sigma_r = 0 \quad . \tag{14}$$

Adding and subtracting Equations (13) and (14), we obtain

$$(\sigma + u)_t + (u + a)\ (\sigma + u)_r + \frac{2au}{r} = 0 \quad , \tag{15}$$

$$(\sigma - u)_t + (u - a)\ (\sigma - u)_r + \frac{2au}{r} = 0 \quad , \tag{16}$$

respectively. It may be shown that for isentropic flow

$$\sigma = \frac{2a}{\gamma - 1} \quad . \tag{17}$$

Equations (15), (16) and (8), with the substitution of Eq. (17), can then be cast into characteristic form as follows

On Γ^+ curve:

$$\begin{cases} \dfrac{dr}{dt} = u + a & (18) \\[2ex] \dfrac{d}{d\Gamma}\left(\dfrac{2a}{\gamma - 1} + u\right) + \dfrac{2au}{r} = 0 & (19) \end{cases}$$

On Γ^- curve:

$$\begin{cases} \dfrac{dr}{dt} = u - a & (20) \\[2ex] \dfrac{d}{d\Gamma}\left(\dfrac{2a}{\gamma - 1} - u\right) + \dfrac{2au}{r} = 0 & (21) \end{cases}$$

On Γ^o curve:

$$\begin{cases} \dfrac{dr}{dt} = u & (22) \\ \dfrac{dp}{d\Gamma} - a^2 \dfrac{d\rho}{d\Gamma} = 0 & (23) \end{cases}$$

where $d/d\Gamma$ is the total differentiation with respect to t along the corresponding characteristics.

Equations (18), (20) and (22) define the direction of the characteristics Γ^+, Γ^- and Γ^0 respectively. Along these characteristics, the compatibility relations, i.e., Equations (19), (21) and (23), are satisfied accordingly. A sketch of Γ^+, Γ^- and Γ^0 characteristics are shown in Figure 5. It should be noted that the characteristics Γ^0 are identical to the streak lines of the fluid particle. Furthermore, the blast wave front follows closely with one of the Γ^+ characteristics.

Separate treatments for the blast wave front and the other part of the blast wave are necessary. At the wave front the pressure, density and particle velocity are discontinuous. Such discontinuities are described by the shock adiabatics [Ref. 7]

$$u_{sh}^2 = \frac{1}{2} a_o^2 \left(\frac{\gamma + 1}{\gamma} \frac{p}{p_o} + \frac{\gamma - 1}{\gamma} \right) . \tag{24}$$

$$u = \frac{a_o^2}{\gamma u_{sh}} \left(\frac{p}{p_o} - 1 \right) , \tag{25}$$

$$\rho = \rho_o \frac{(\gamma + 1)p + (\gamma - 1)p_o}{(\gamma - 1)p + (\gamma + 1)p_o} , \tag{26}$$

where u_{sh} is the velocity of the shock front and p, u and ρ are the pressure, fluid velocity and density just behind the shock front, respectively. Notice that through Equations (24)-(26) all the four quantities u_{sh}, p, u and ρ are determined when one of them, u_{sh} say, is known. When p and ρ are known, the velocity of sound just behind the shock front can also be calculated from the

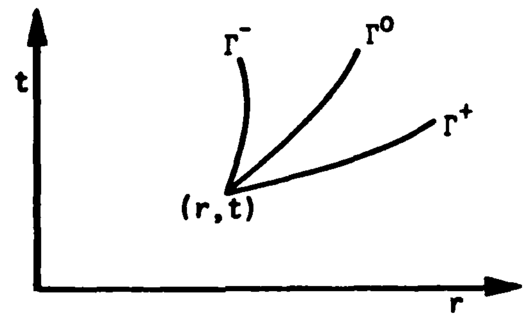


Figure 5. Characteristics in r-t Plane.

relation $a^2 = \gamma p/\rho$. Now the pair of equations (18) and (19) of the Γ^+ characteristics reduces essentially to involve only one unknown flow variable and therefore can be solved.

For other parts of the wave, all three characteristics Γ^+, Γ^- and Γ^0 are needed to determine the flow variables. Equations (18) to (21) consist of only two unknown flow variables, u and a. These equations are solved first. Once u and a are found, Equations (22) and (23) can be used to obtain the solution of p after the substitution of $\rho = \gamma p/a^2$.

The solution of the characteristic equations, Eqs. (18) to (21), is based on the upstream interpolation scheme introduced by Belotserkovskii and Chushkin [Ref. 8]. The basic idea is as follows: Firstly, approximate those equations by use of first order implicit finite difference formula for small time steps, which results in a piecewise linear characteristic network. Implicit finite difference method has the advantage that it is stable and therefore allows the use of larger sizes of Δr and Δt. The wave front is traced by following one of the Γ^+ characteristics, initiated at the boundary of the pressurized gas sphere. This particular characteristic divides the disturbed flow region from the undisturbed one. A number of points in r-direction with equal spacing δr are used. The exact number depends on how far from the muzzle brake we want to calculate. Convergent solutions at one time level are extrapolated to give initial guesses for flow variables at the next time level. They are substituted into Equations (18) and (20) which give roughly the locations of the Γ^+ and Γ^- curves at old time level. Hence flow variables at these locations can be determined by interpolation between the convergent solutions at the old time level. With this information fresh values at new time level are obtained from Equations (19) and (21). These fresh values at new time level

can be substituted into Equations (18) and (20) again to initiate another cycle of iteration. This iteration process is repeated until two successive guesses of the flow variables at the new time level agree within sufficiently close limits. Due to the implicit nature of the method, similar procedure is used in calculating the wave front and in solving p and ρ in Equations (22) and (23). The solution procedure can be summarized in the following flow chart (Figure 6). More detailed discussion of the iteration procedure is presented in Section 2.1.4.

2.1.4 Iteration Procedure for the Γ^+ and Γ^- Characteristics

We present the iteration procedure for the Γ^+ and Γ^- characteristics in detail in the following. The iteration procedures on the Γ^0 characteristics and for the shock front are similar and are not detailed here.

Let r_i, $i = 1, \ldots, N$ be a set of equally spaced mesh points of the radial variable r, which is fixed once of all, for all time steps. We consider the finite difference equations of (18)-(21) between the instants t and $t + \delta t$ in the following form:

$$r_i - r_{i\pm}(t) = \frac{\delta t}{2} \{u[r_{i\pm}(t), t] + u[r_i, t + \delta t] \pm a[r_{i\pm}(t), t] + a[r_i, t + \delta t]\} \tag{27}$$

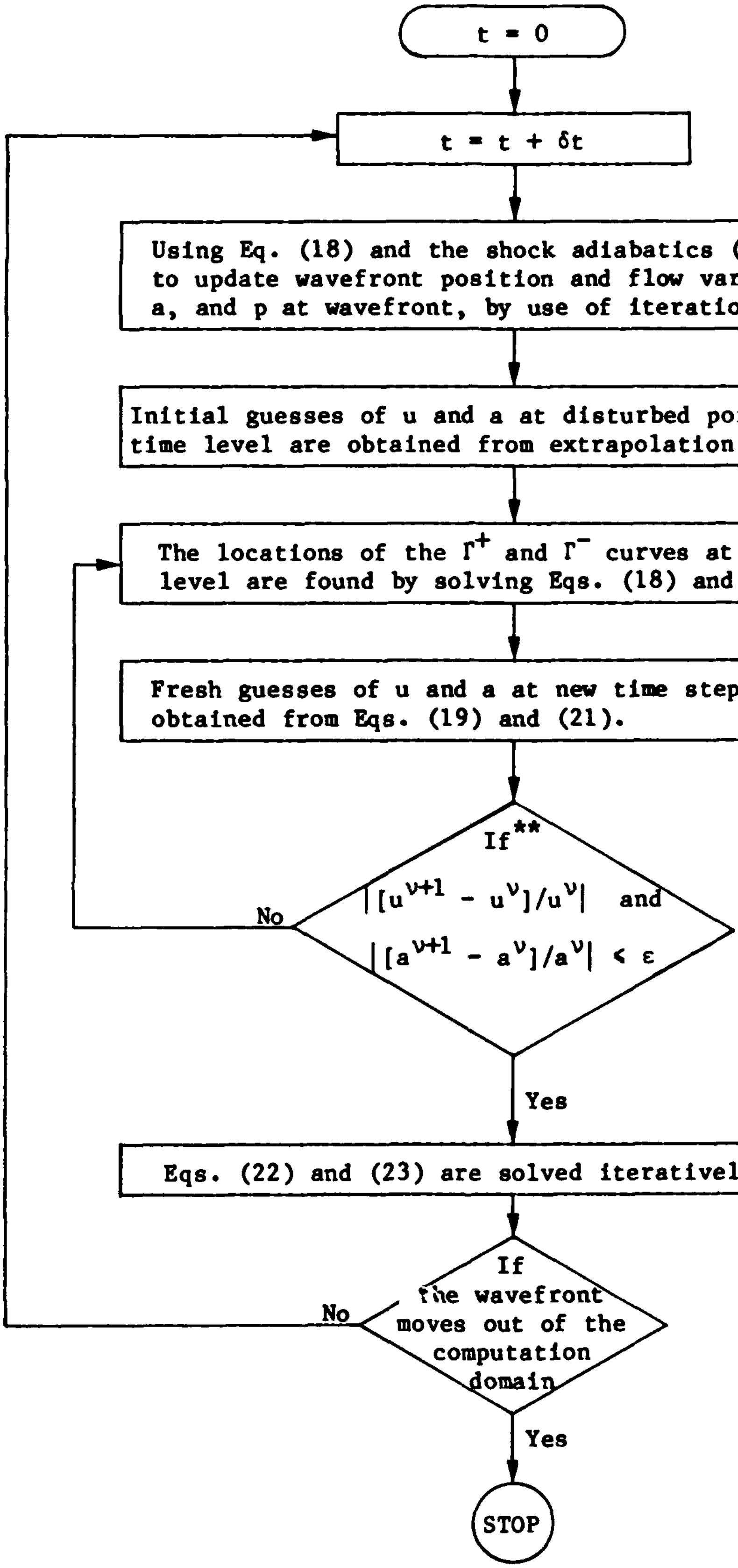
$$J_\pm(r_i, t + \delta t) - J_\pm[r_{i\pm}(t), t] = - \frac{\delta t}{2} \{f[r_{i\pm}(t), t] + f[r_i, t + \delta t]\} \tag{28}$$

where

$$J_\pm(r,t) = \frac{2a(r,t)}{\gamma - 1} \pm u(r,t) \tag{29}$$

$$f(r,t) = 2a(r,t)\, u(r,t)/r \tag{30}$$

In these equations, the alternative signs $\pm$ are for Γ^+ or Γ^- characteristics, respectively. The quantities $r_{i\pm}(t)$ are the points on the $\Gamma^\pm$ characteristics, which will propagate to r_i at $t + \delta t$. Note that $r_{i\pm}(t)$ do not in general locate at the mesh points r_i. We assume that the flow variables at the mesh



**The superscript ν denotes the νth iteration, and ε is the tolerance limit of relative error for convergence.

Figure 6. Flow Chart for the Method of Characteristics.

point r_i at time t [i.e., u(r,t) and a(r,t)] and those at previous time steps are known. We need to find the flow variables at the mesh points at time $t + \delta t$ [i.e., $u(r_i,t+\delta t)$ and $a(r_i,t+\delta t)$].

Equations (27)-(28) are implicit finite difference equations because the quantities multiplied by δt in the right hand side of these equations involve the unknown flow variables. These equations also involve the unknown $r_{i\pm}(t)$. We solve these equations by the following iteration procedure.

Let us denote the initial guess with a superscript 0 and the subsequent iterated values with superscripts $\nu = 1, 2, \ldots$. The initial guess $u^0(r_i, t+\delta t)$ is obtained for the fluid velocity from an extrapolation using the values $u(r_i, t)$ and $u(r_i, t - \delta t)$. A similar initial guess $a^0(r_i, t+\delta t)$ is obtained for the velocity of sound. The initial values $r^0_{i\pm}(t)$ of $r_{i\pm}(t)$ are then calculated from

$$r^0_{i\pm}(t) = r_i - \{u^0(r_i, t + \delta t) \pm a^0(r_i, t + \delta t)\} \quad . \tag{31}$$

With this set of initial values, we can start the iteration.

In the νth cycle of the iteration $u^{\nu-1}(r_i,t+\delta t)$, $a^{\nu-1}(r_i,t+\delta t)$ and $r^{\nu-1}_{i\pm}(t)$ are known and we need to determine their new iteration values $u^\nu(r_i,t+\delta t)$, $a^\nu(r_i,t+\delta t)$ and $r^\nu_{i\pm}(t)$. This is executed as follows. First, $u[r^{\nu-1}_{i\pm}(t),t]$ and $a[r^{\nu-1}_{i\pm}(t),t]$ are calculated by interpolation from the set of $u(r_j,t)$ and $a(r_j,t)$, $j = 1, \ldots, N$. We can then calculate $r^\nu_{i\pm}(t)$ from

$$r^\nu_{i\pm}(t) = r_i - \frac{\delta t}{2} \{u[r^{\nu-1}_{i\pm}(t),t] + u^{\nu-1}(r_i, t+\delta t) \pm a[r^{\nu-1}_{i\pm}(t),t] \pm a^{\nu-1}[r_i, t+\delta t]\} \quad . \tag{32}$$

With another interpolation at $r^\nu_{i\pm}$, we can obtain $J_\pm{}^\nu$ from

$$J^\nu_\pm(r_i, t+\delta t) = J_\pm[r^\nu_{i\pm}(t),t] - \frac{\delta t}{2} \{f[r^\nu_{i\pm}(t),t] + f^{\nu-1}(r_i,t+\delta t)\} \quad . \tag{33}$$

Now using Equation (29), we have

$$u^{\nu}(r_i,\ t+\delta t) = \frac{1}{2}\ \{J_{+}^{\nu}(r_i,\ t+\delta t) + J_{-}^{\nu}(r_i,\ t+\delta t)\} \tag{34}$$

$$a^{\nu}(r_i,\ t+\delta t) = \frac{\gamma - 1}{4}\ \{J_{+}^{\nu}(r_i,\ t+\delta t) - J_{-}^{\nu}(r_i,\ t+\delta t)\} \tag{35}$$

and these are the new iteration values we sought.

The iteration is repeated until the following convergence conditions are fulfilled:

$$|\{u^{\nu}(r_i,\ t+\delta t) - u^{\nu-1}(r_i,\ t+\delta t)\}/u^{\nu}| < \varepsilon_u \tag{36}$$

$$|\{a^{\nu}(r_i,\ t+\delta t) - a^{\nu-1}(r_i,\ t+\delta t)\}/a^{\nu}| < \varepsilon_a \tag{37}$$

where ε_u and ε_a are predetermined small quantities. When these conditions are satisfied, one can see that the Equations (32) and (33) are approximations of the original finite difference equations (27) and (28), with $r_{i\pm}(t) = r_{i\pm}^{\nu}(t)$, $u(r_i,\ t+\delta t) = u^{\nu}(r_i,\ t+\delta t)$ and $a(r_i,\ t+\delta t) = a^{\nu}(r_i,\ t+\delta t)$ as the approximate solutions.

2.1.5 Input-Output of the BLAST Code

The detailed input to the BLAST code is described in Table 2. However, most of the parameters there are related to the numerical methods and output options. Therefore Table 3 indicates a shorter list that can be used in conjunction with the default values.

The code presents pressure-time histories and other important physical quantities at specified spatial locations, in the form of tables or graphics. Some of these quantities are as follows:

(1) P_1: the direct incident overpressure in psi.

(2) P_2: the reflected component of the overpressure wave, in psi. Note that the maximum of P_2 is not equal to the height of the second peak in the pressure-time history.

Table 2. Full Input Required for Blast Code.

Card	FORTRAN Identifier	Meaning	Units
CARD 1	DR	Spatial increment in radial direction	ft
	DT	Time step of calculation	sec
	TMAX	Maximum time of problem	sec
	IMAX	Maximum number of spatial points along radial line	--
CARD 2	RF	Radius of spherical source	ft
	PO	Ambient atmospheric pressure	psi
	RHO	Ambient atmospheric density	$slug/ft^3$
	GAMMA	Ratio of specific heats	--
CARD 3	I1	Number of radial points to be contoured	--
	KK	Number of different gun elevations	
CARD 4 (total of KK cards)	HPIVOT	Height of gun pivot point	ft
	GUNLENF	Length of gun barrel from pivot point	ft
	ELEVATION	Elevation angle	deg
CARD 5	IFLALNG	Flag to obtain lung calculation	--
	IFLGP	Flag to obtain plot graphics	--
	IFLGTAP	Flag to obtain tape storage	--
CARD 6	NTOT	Total number of radial lines	--
	NP	Number of radial lines to be contoured	--
CARD 7	PSI(I), ..., PSI(NTOT)	Angular position of rays	deg
CARD 8	II	Total number of radial points to be calculated.	--
CARD 9	X(I1+1), ..., X(II)	Coordinates of points to be calculated but not plotted.	ft
CARD 10	PS	Source pressure	atm

One set of cards #8, 9, 10 for each radial line.

(3) P_{stat}: the peak static overpressure, in psi. It is the maximum value of the overpressure in the pressure-time history.

(4) P_{dyn}: peak dynamic pressure, in psi.

(5) A_{dur}: A-duration, in seconds.

(6) A_{imp}: A-impulse, in psi-sec.

Table 3. Short Form of Input.

I. Other elevations of previously calibrated gun.		
ELEVATN	Gun Elevation	deg
II. Different muzzle brake design.		
PS(1), ..., PS(NP)	Source strength along each ray	atm

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7. Landau, L. D. and Lifshitz, E. M., "Fluid Mechanics," (1959).

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2.2 COMPARISON WITH M198 DATA

2.2.1 Comparison by Matching Maximum Pressure

As a validation of the BLAST code, we compare here results of the BLAST code calculation with the M198 howitzer data in the May 15, 1979 firings, as tabulated in the Final Report prepared by JAYCOR under the contract with WRAIR (No. DAMD17-78-C-8087).

Figure 7 shows the ground map for all the locations where pressure measurements were taken and at which comparison with calculation is made. In the measurement, the gun was set at three elevation angles, equal to 800, 267 and 45 mils (45°, 15° and 2.53°, respectively) and was fired several times so that for each elevation angle and at each location three sets of data were recorded. Part of the data is reproduced together with results of our calculation in Figures 9-11 and 16-18.

As a first test of the BLAST code, calculations are performed by choosing a set of initial pressures P_s, one for each radial line (at azimuthal directions ψ = 0°, 30°, 60°, 120° and 150°), so that the calculated and the measured maximum overpressure match each other at a near field location (10 meter). The P_s values are shown in Figure 8 for the three elevation angles considered. The initial pressurized balloon radius r_o used in this calculation is 3 feet.

The results of the calculation have been reported in the JAYCOR progress report "Far-Field Model and Validation," and they are reproduced here in Figures 9-14. In Figures 9-11 the calculated and the measured pressure-time histories are compared side by side, and in Figures 12-14 the distribution of various quantities, such as the maximum overpressure, A-impulse and A-duration, on all field locations is presented in the form of contour graphs.

In Figures 9-11 one can see that the calculation has reproduced the main features of the measured pressure trace, such as the sharp rise of the pressure at the shock front, the arrival times of the direct incident and ground reflection peaks, the rapid transition from compression and rarefaction and the final, slow relaxation of the rarefaction to ambient. This shows that the method of characteristics is basically a correct approach to the problem.

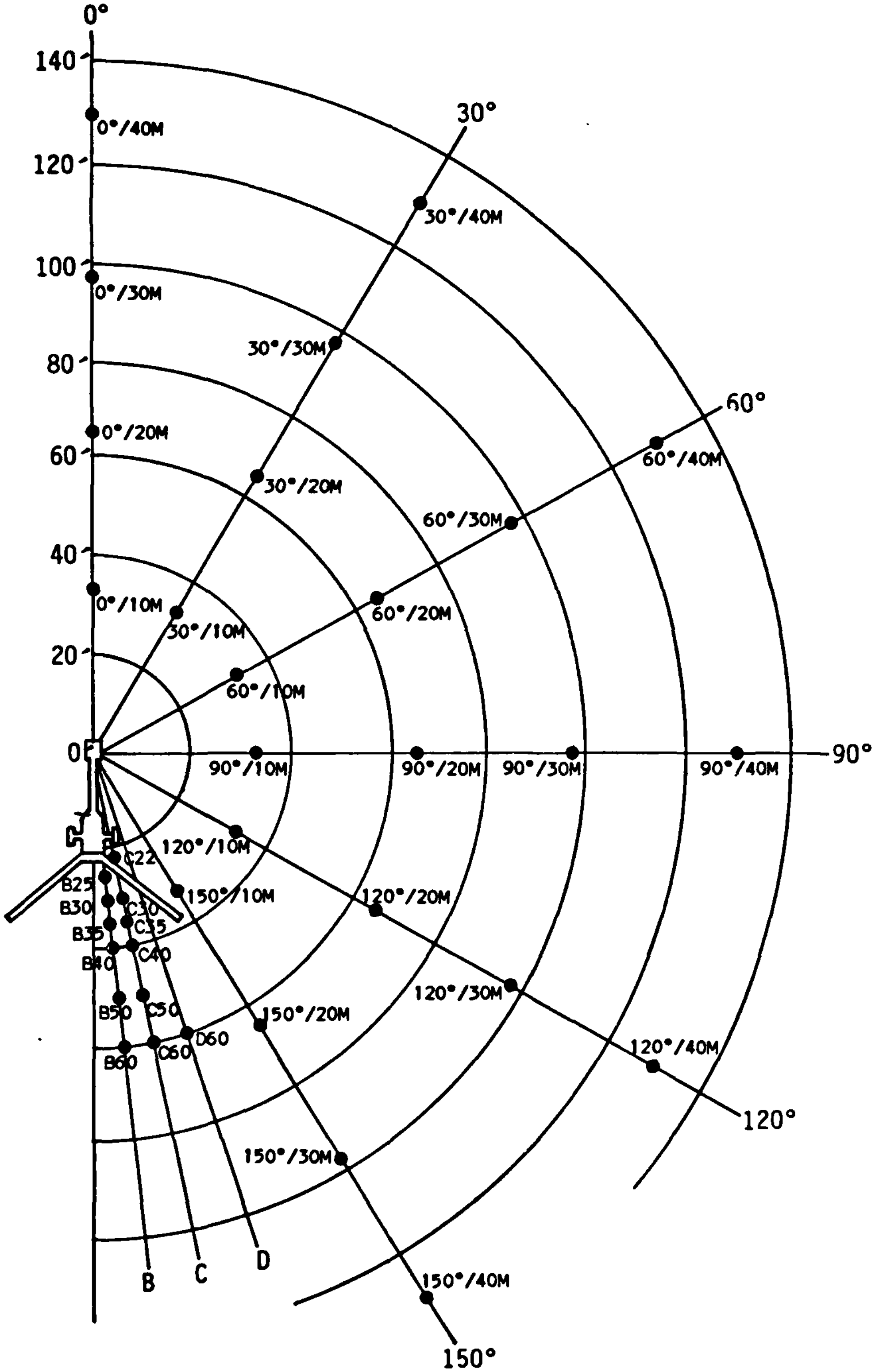


Figure 7. Ground Map for Locations of Measurement.

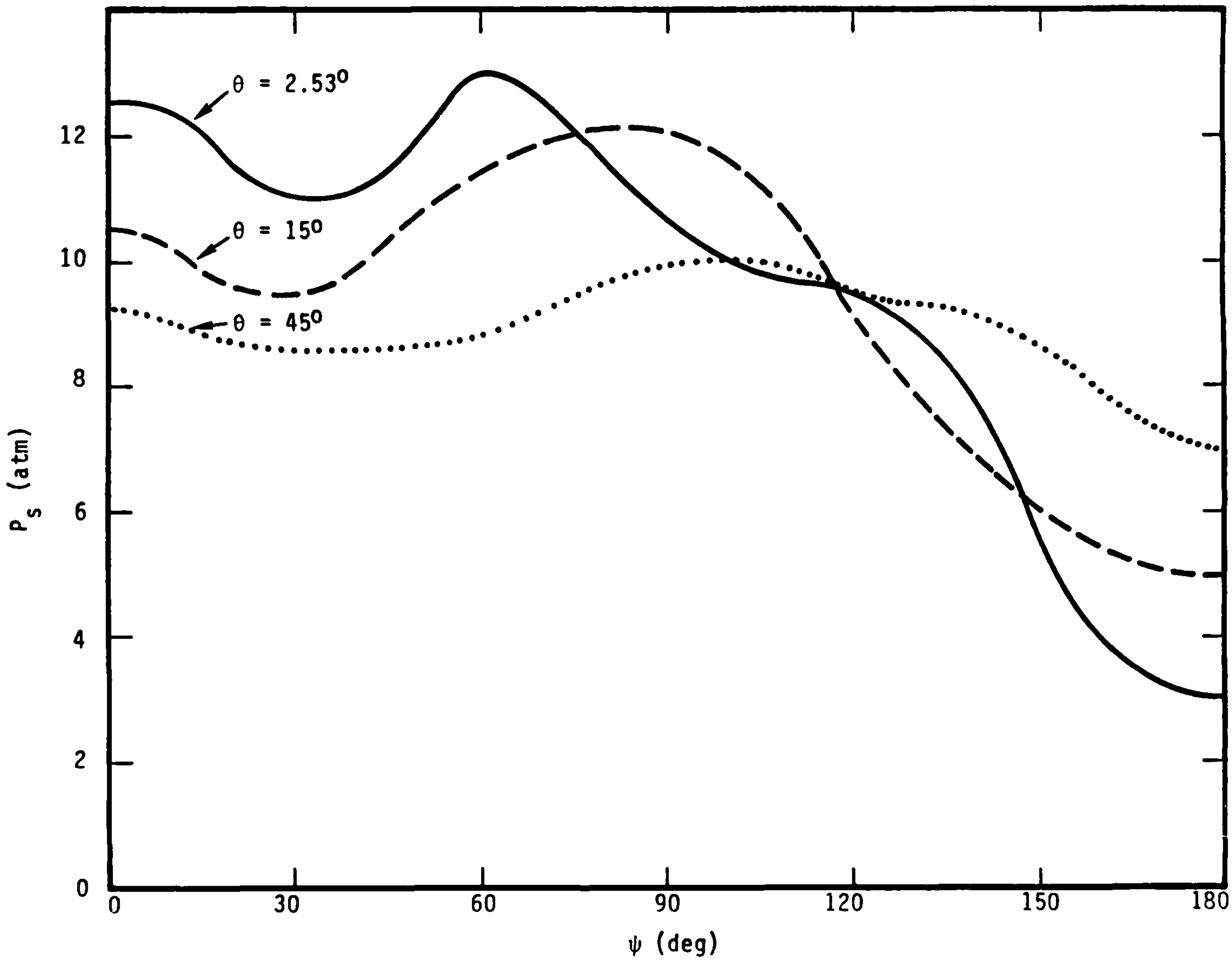


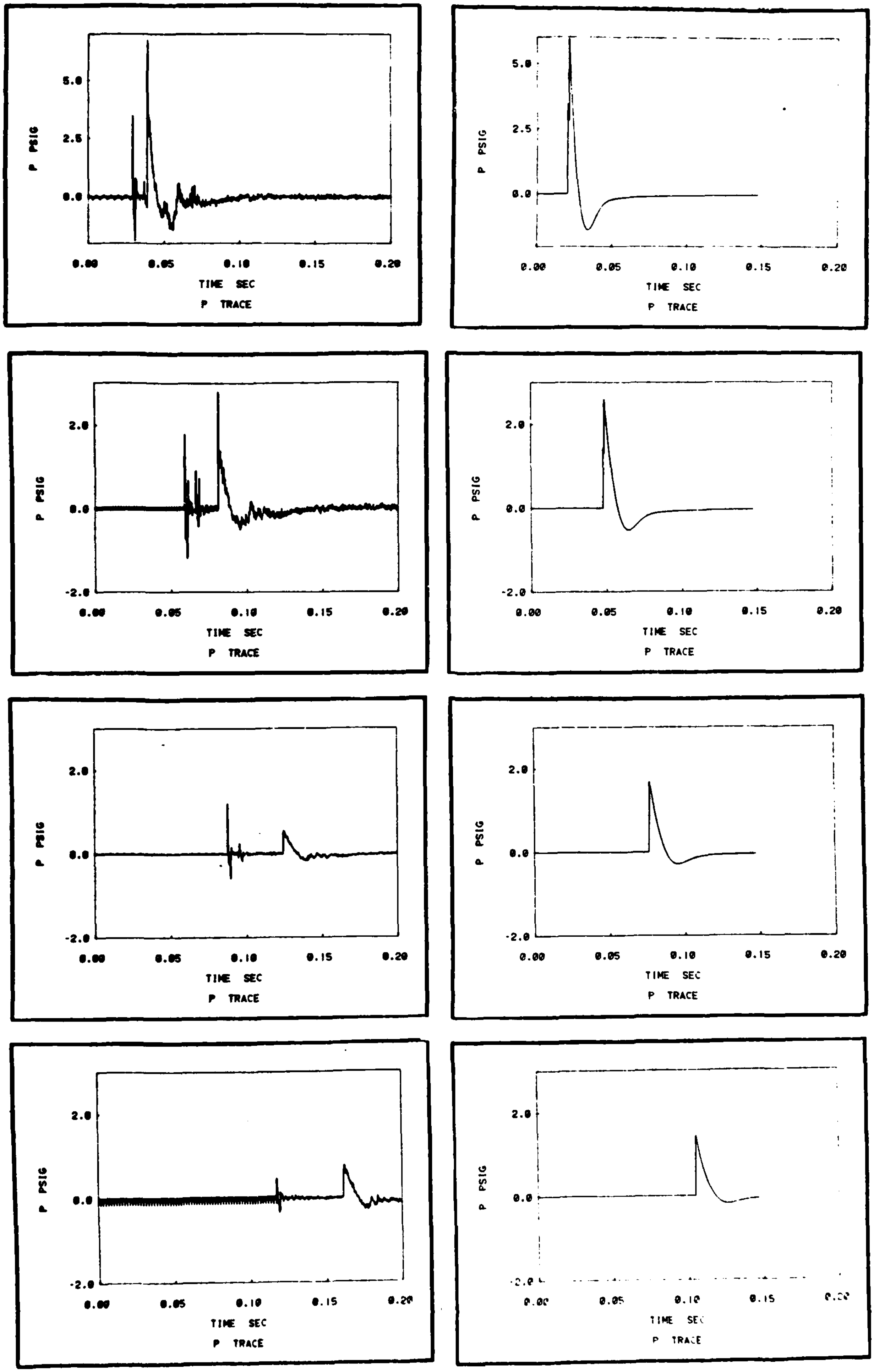
Figure 8. Source Pressures as Calibrated with Peak Pressure for the May 1979 Firings.

Measured | Calculated

Figure 9(a)

$\theta = 2.53°$

$\psi = 0°$



R = 10 m

R = 20 m

R = 30 m

R = 40 m

Measured Calculated

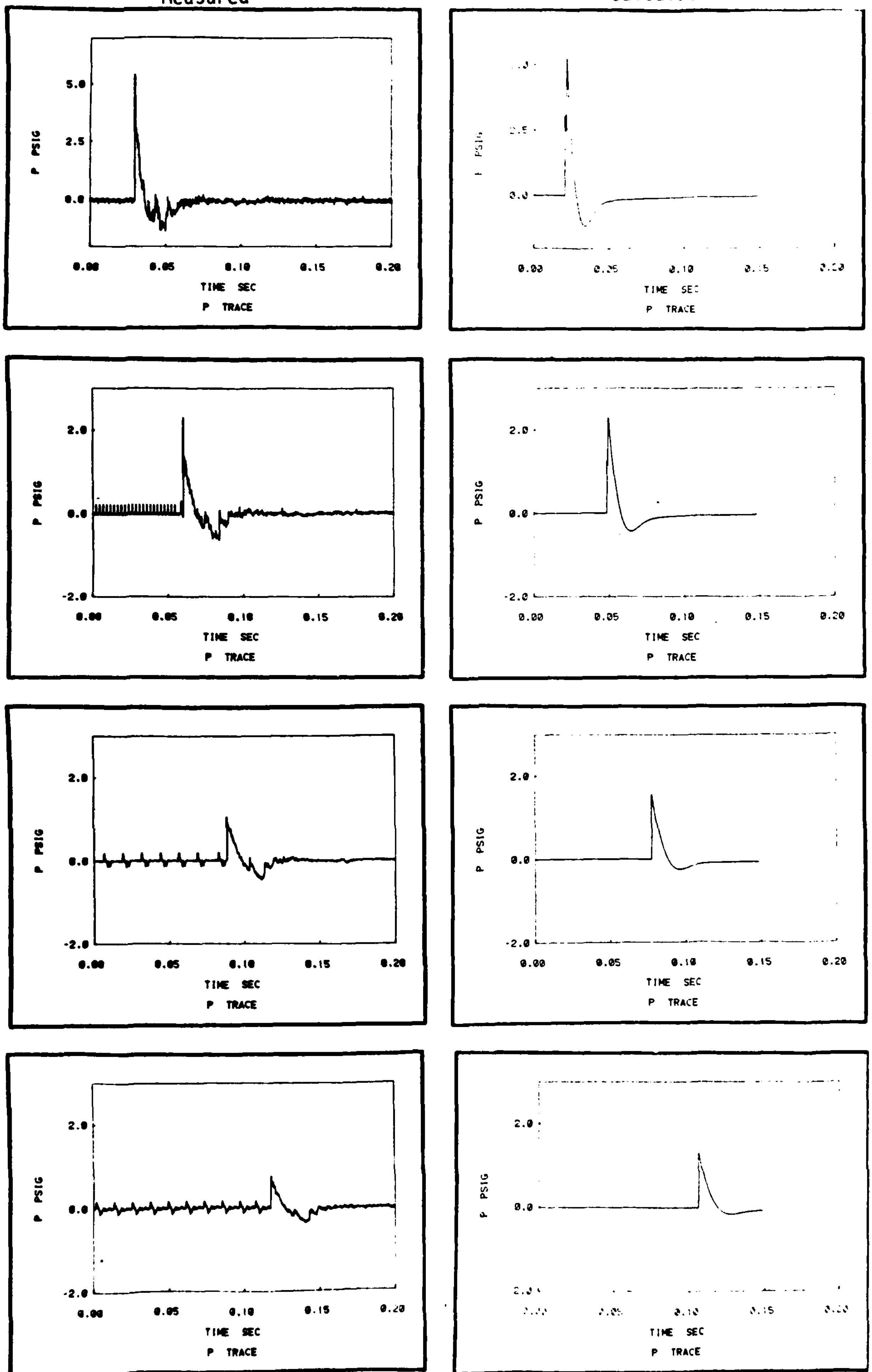


Figure 9(b)

θ = 2.53°

ψ = 30°

R = 10 m

R = 20 m

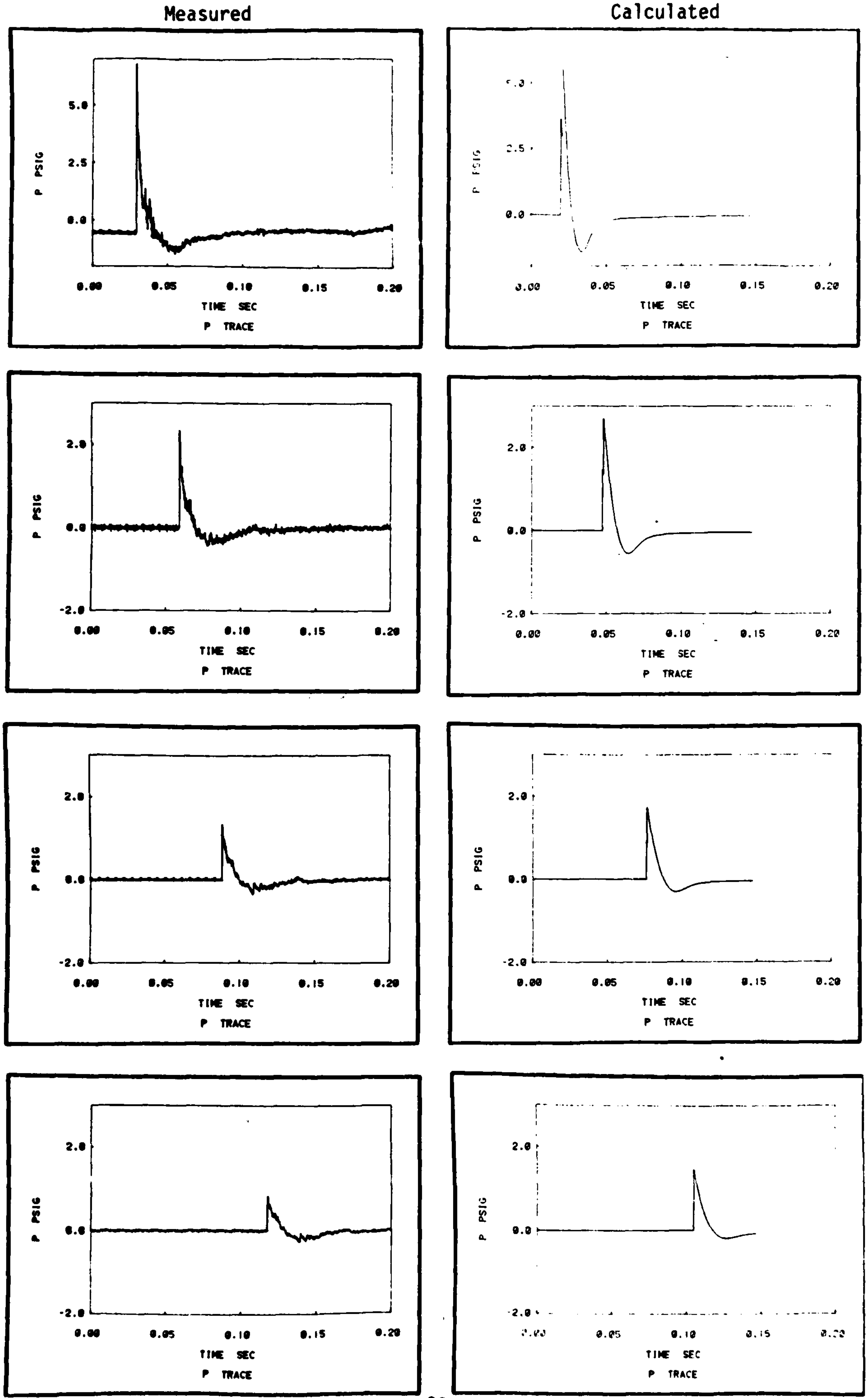
R = 30 m

R = 40 m

Figure 9(c)

θ = 2.53°

ψ = 60°



Measured | Calculated

Figure 9(d)

$\theta = 2.53°$

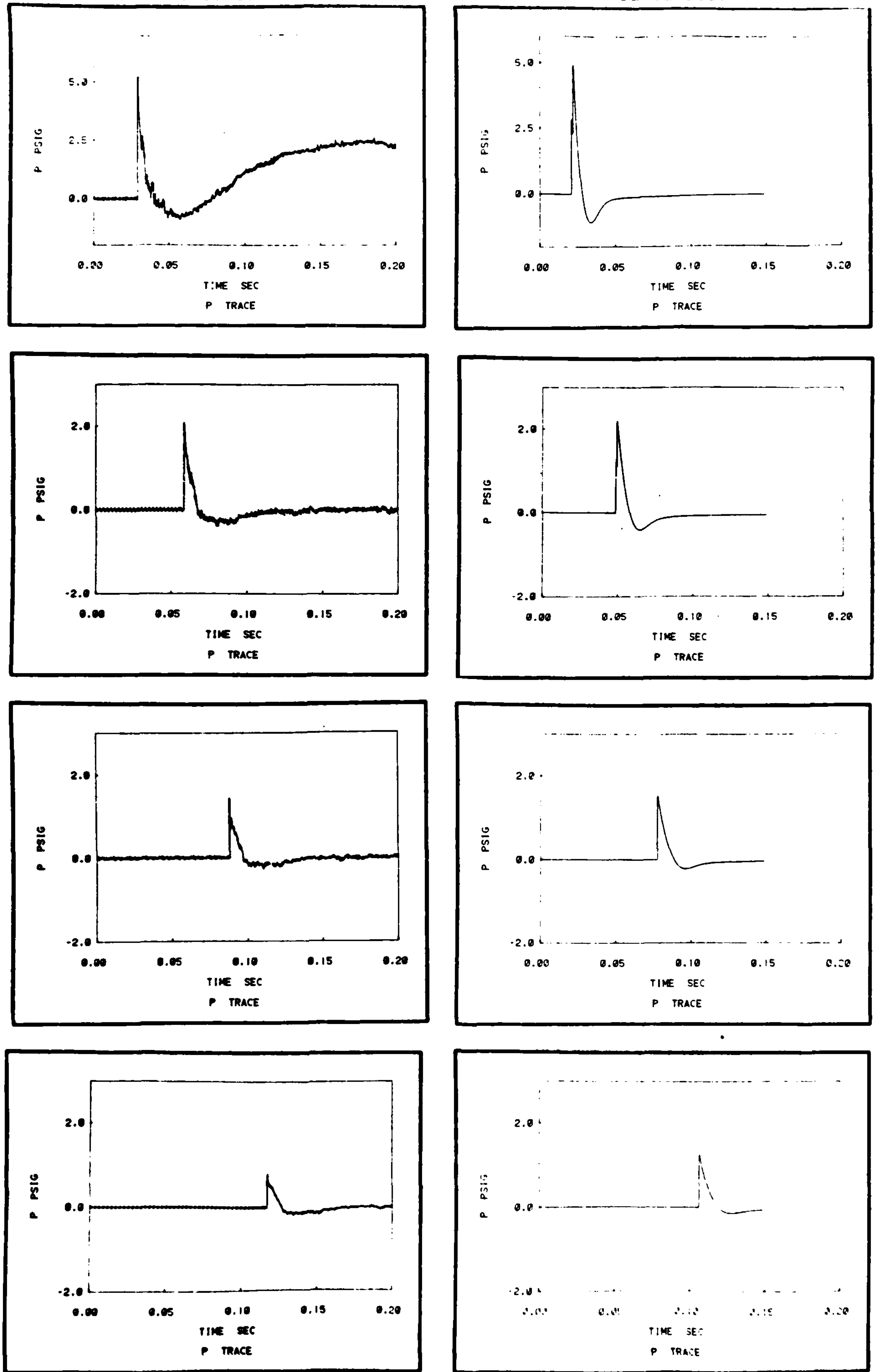
$\psi = 90°$

R = 10 m

R = 20 m

R = 30 m

R = 40 m



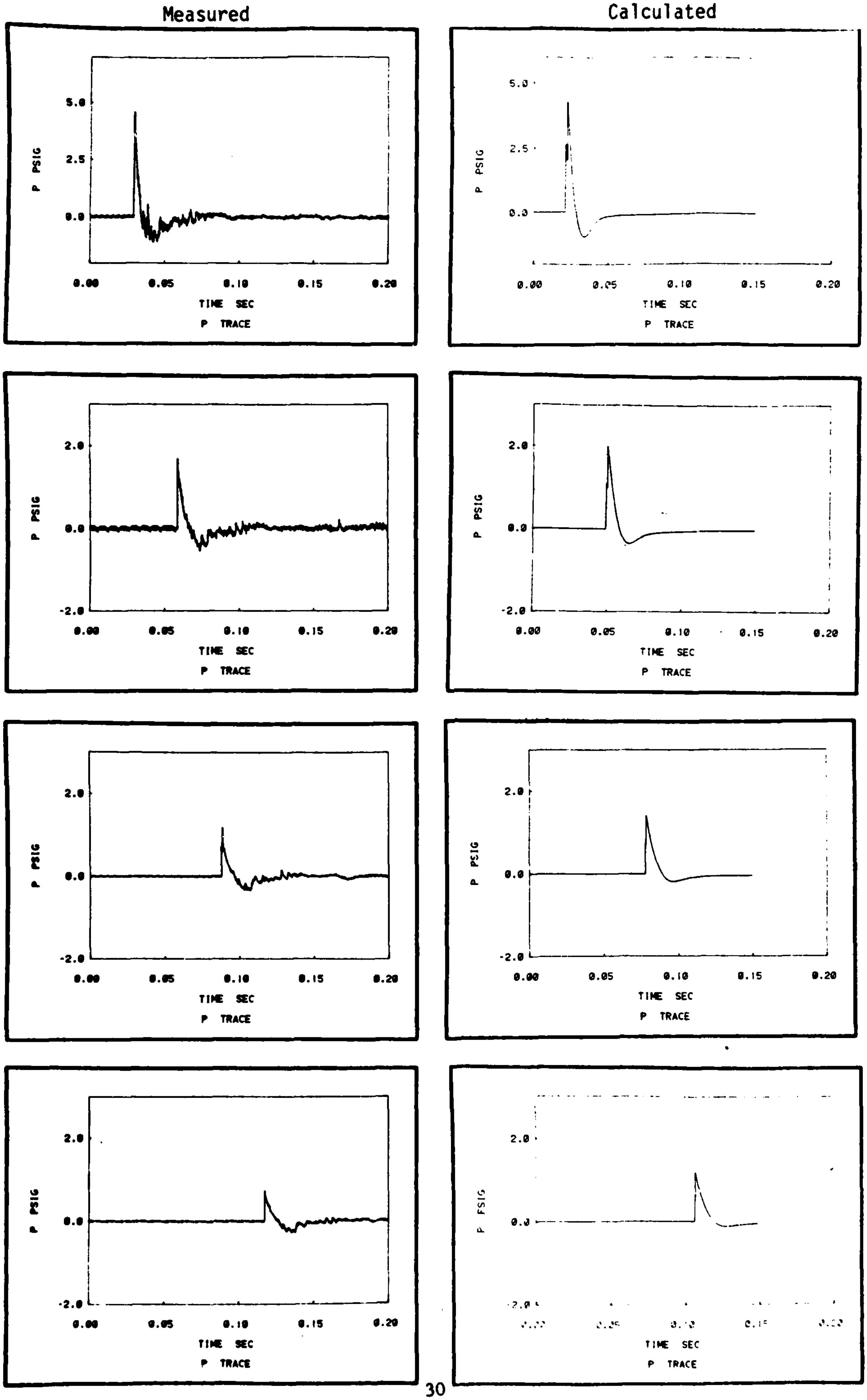


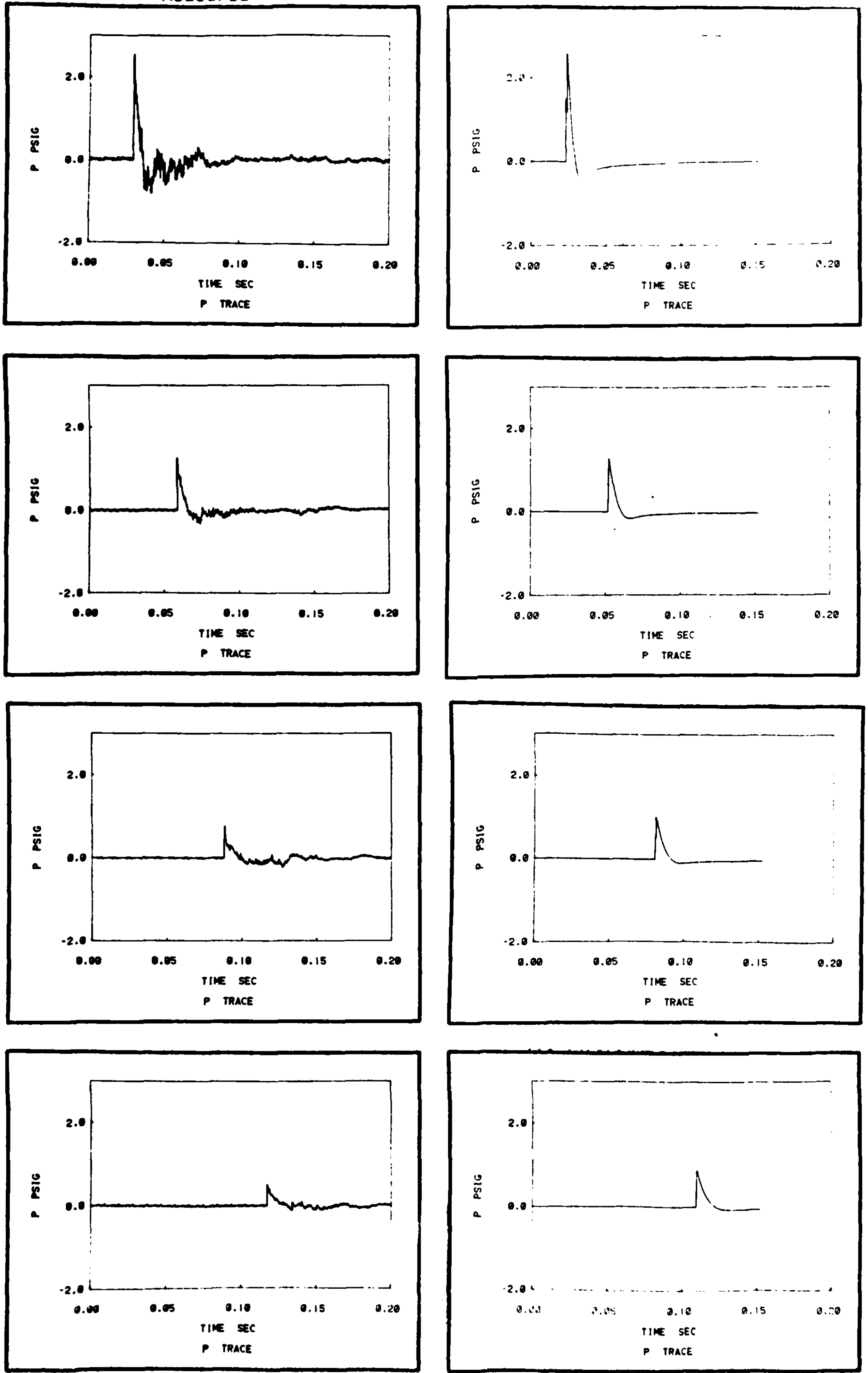
Figure 9(e)
θ = 2.53°
ψ = 120°

Figure 9(f)

$\theta = 2.53°$

$\psi = 150°$

Measured | Calculated



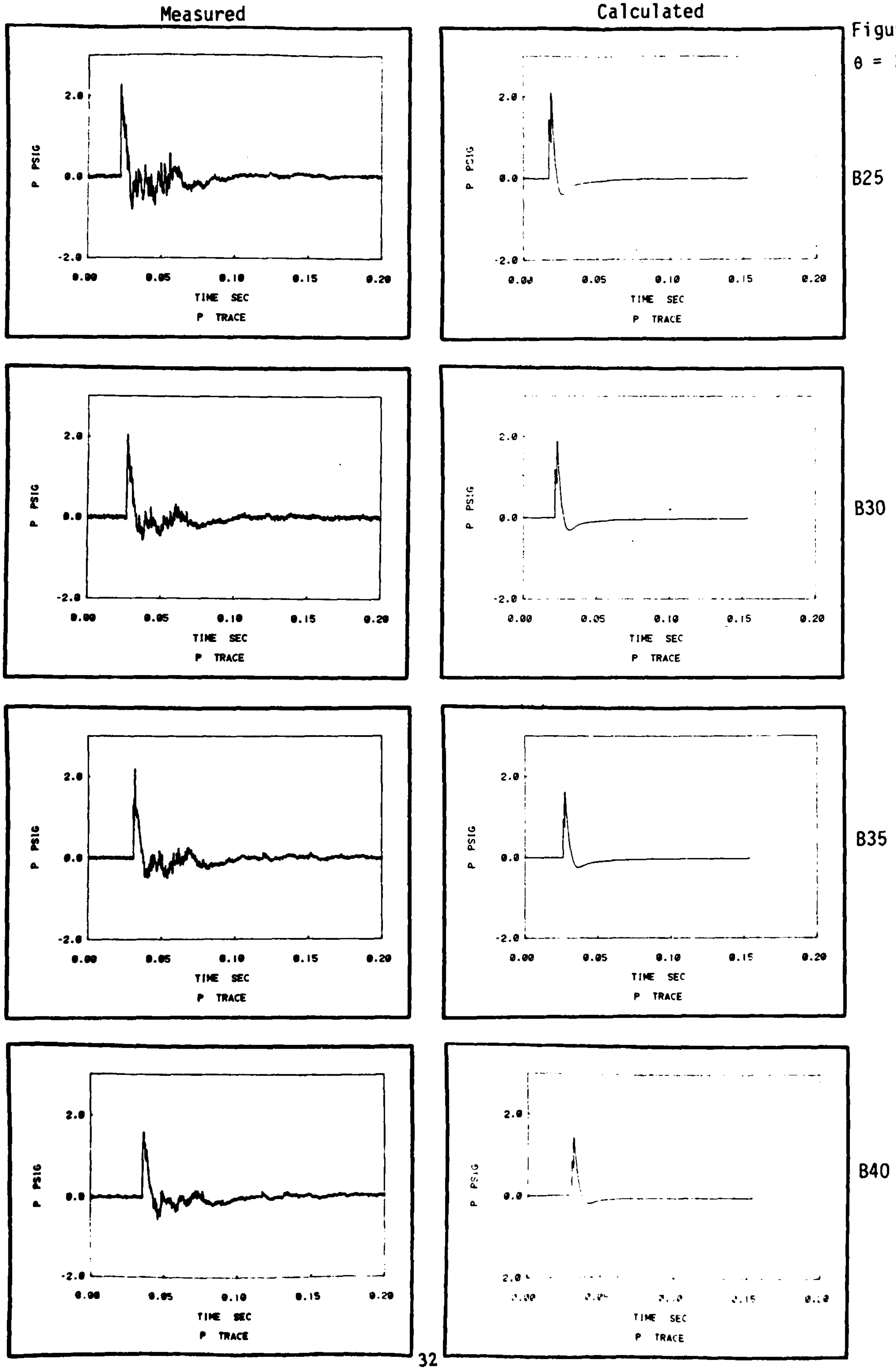
R = 10 m

R = 20 m

R = 30 m

R = 40 m

Figure 9(g)
θ = 2.53°

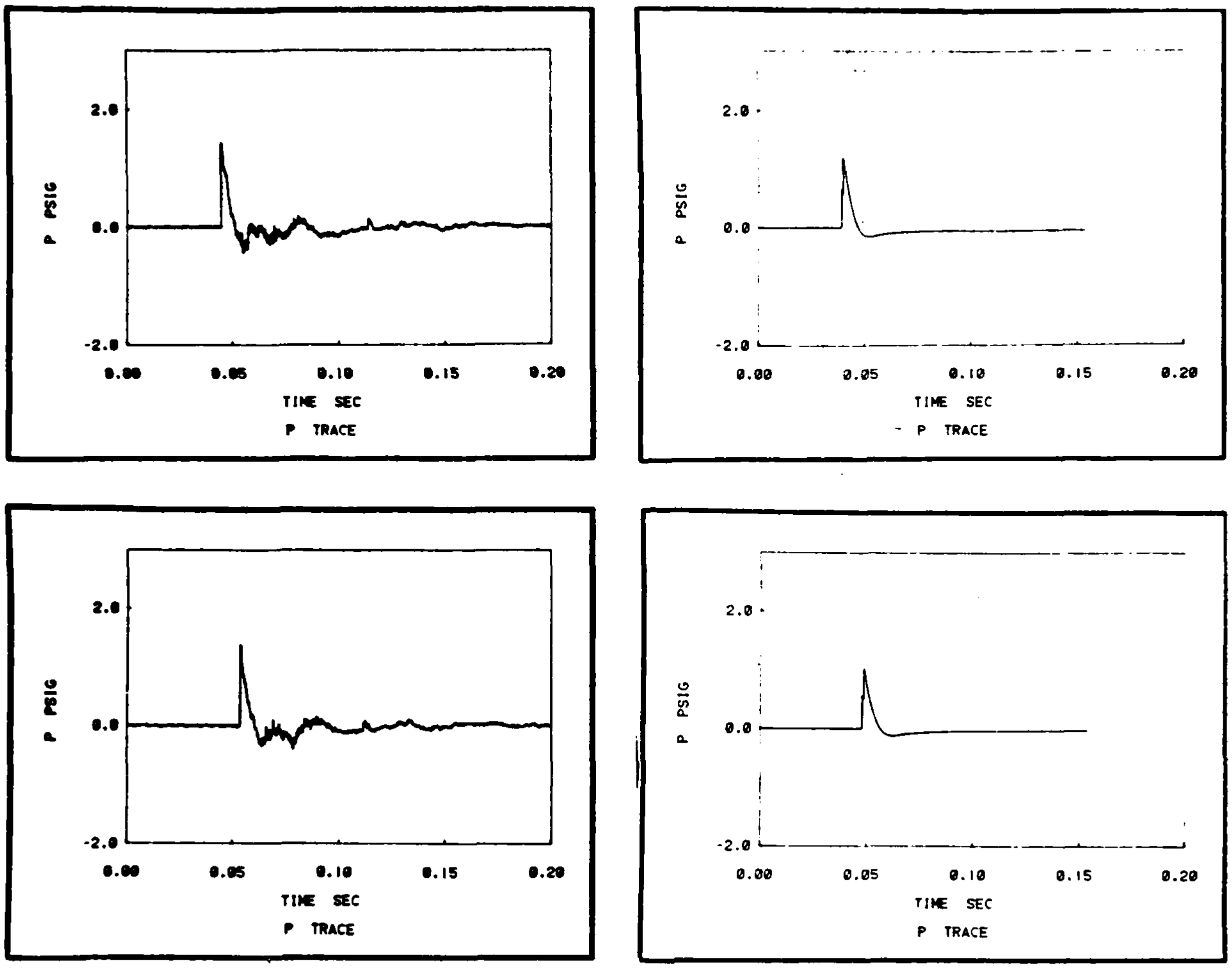


Measured | Calculated

Figure 9(g)

θ = 2.53°

(Cont'd)



B50

B60

Measured | Calculated

Figure 9(h)

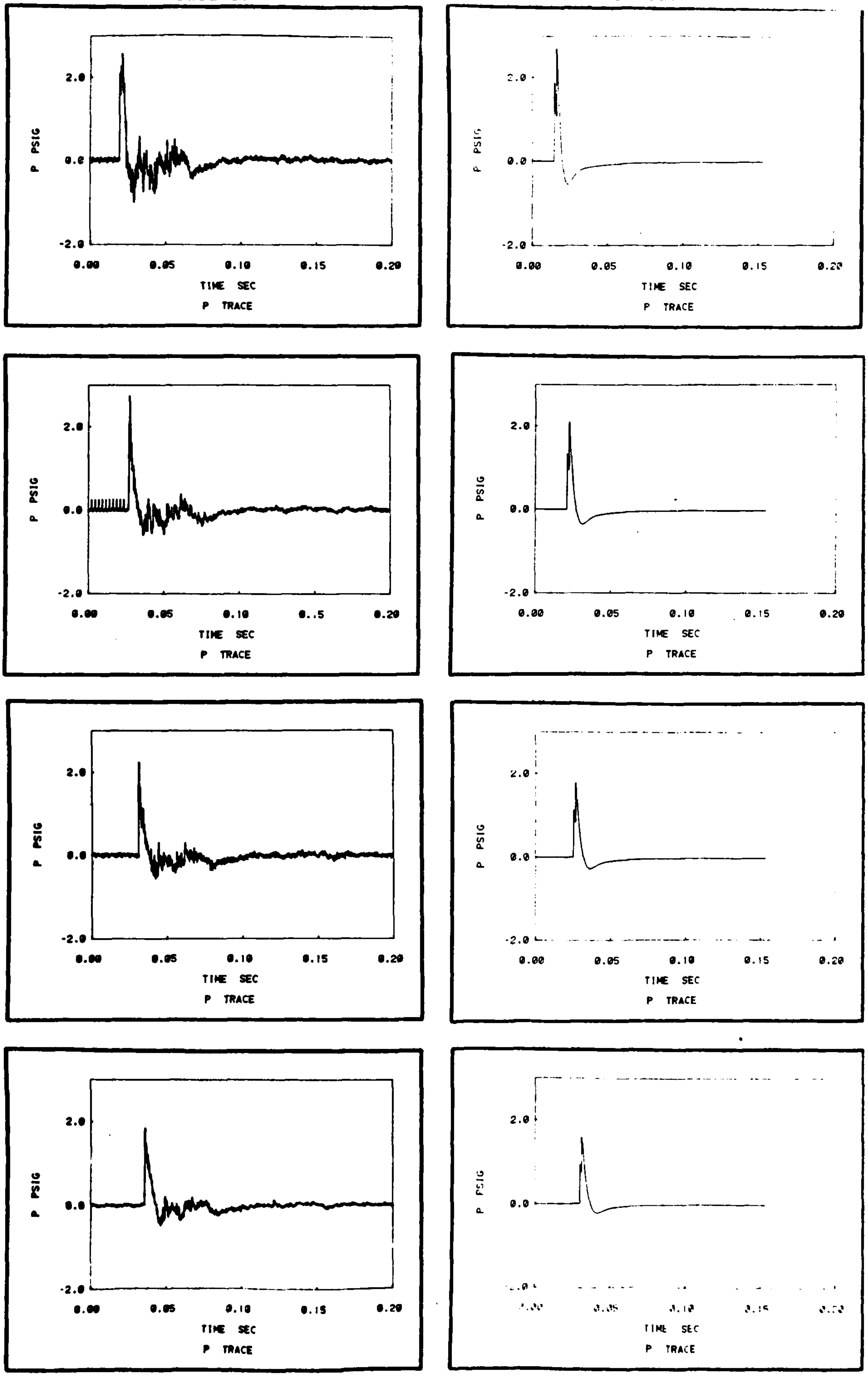
$\theta = 2.53°$

C22

C30

C35

C40



Measured

Calculated

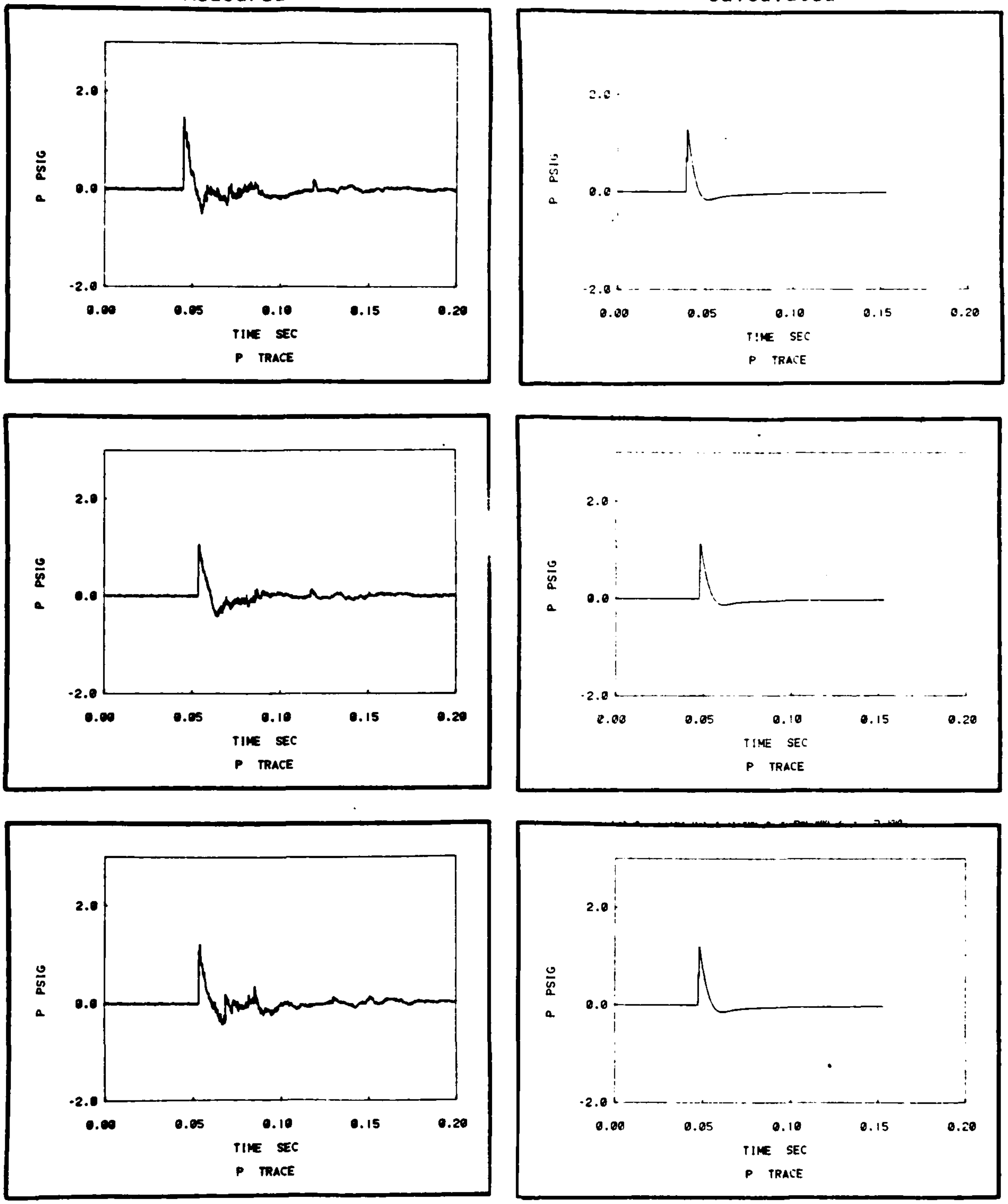


Figure 9(h)
$\theta = 2.53°$
(Cont'd)

Figure 10(a

$\theta = 15°$

$\psi = 0°$

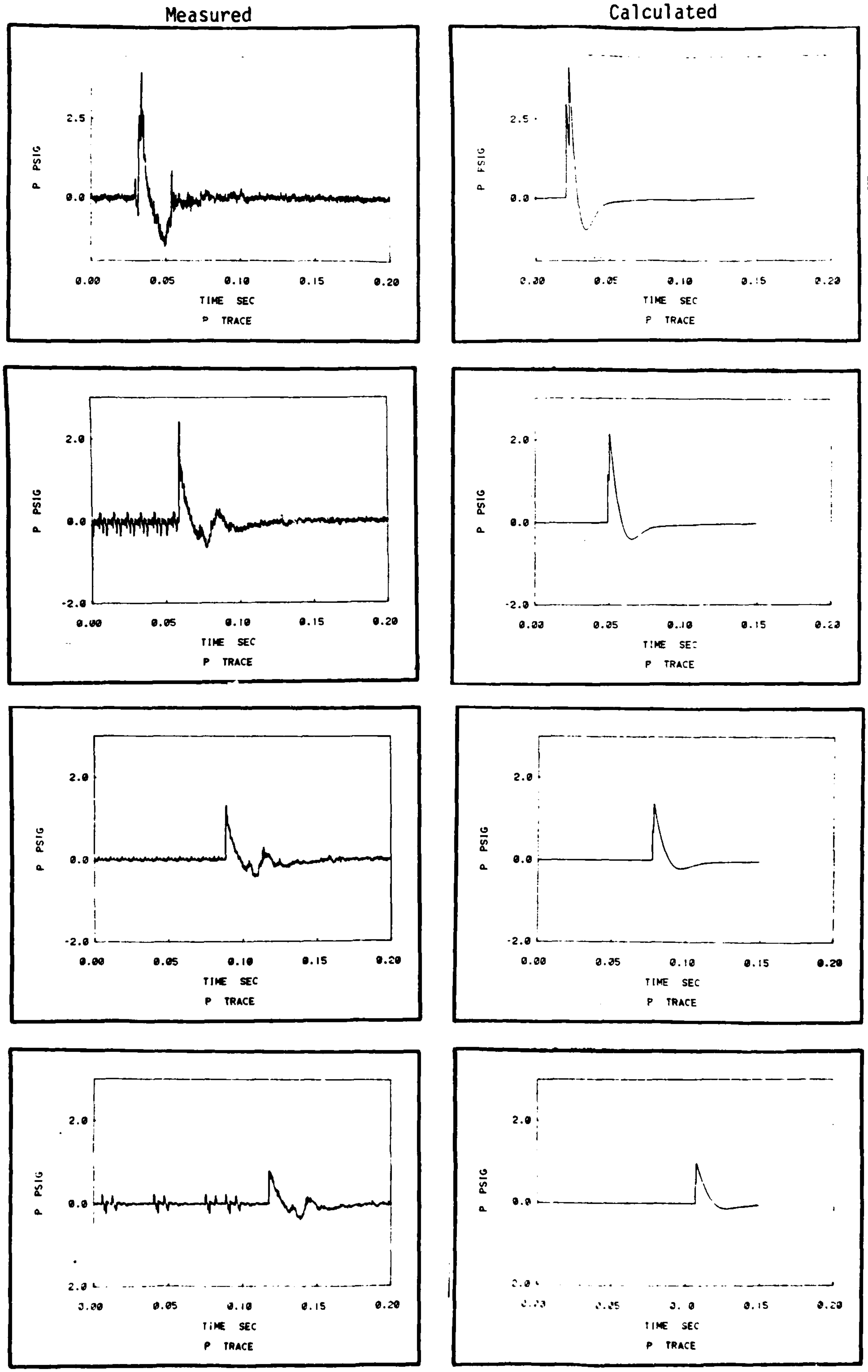
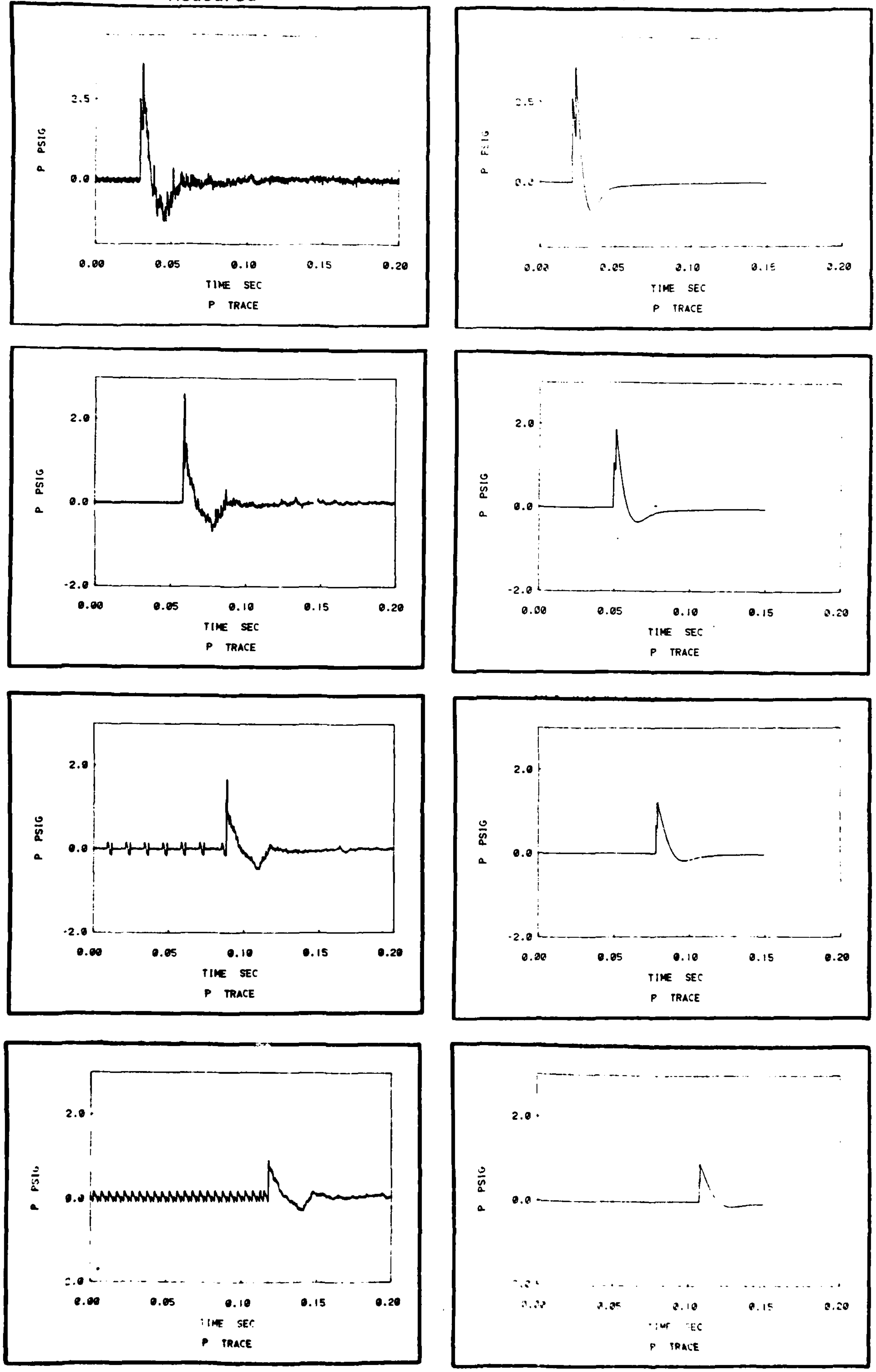


Figure 10(b)

$\theta = 15°$

$\psi = 30°$

Measured | Calculated



R = 10 m

R = 20 m

R = 30 m

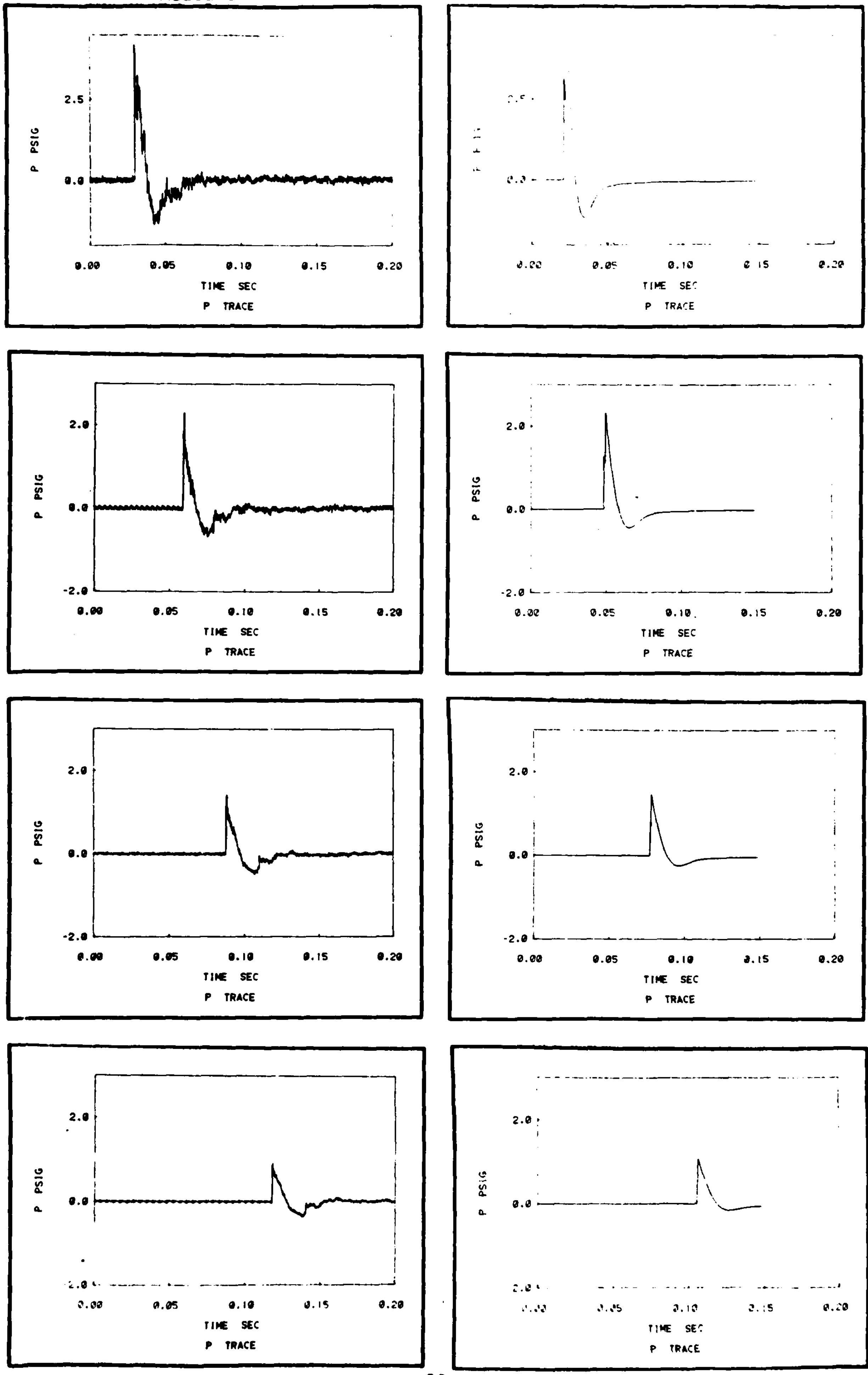
R = 40 m

Measured Calculated

Figure 10(c)

$\theta = 15°$

$\psi = 60°$



R = 10 m

R = 20 m

R = 30 m

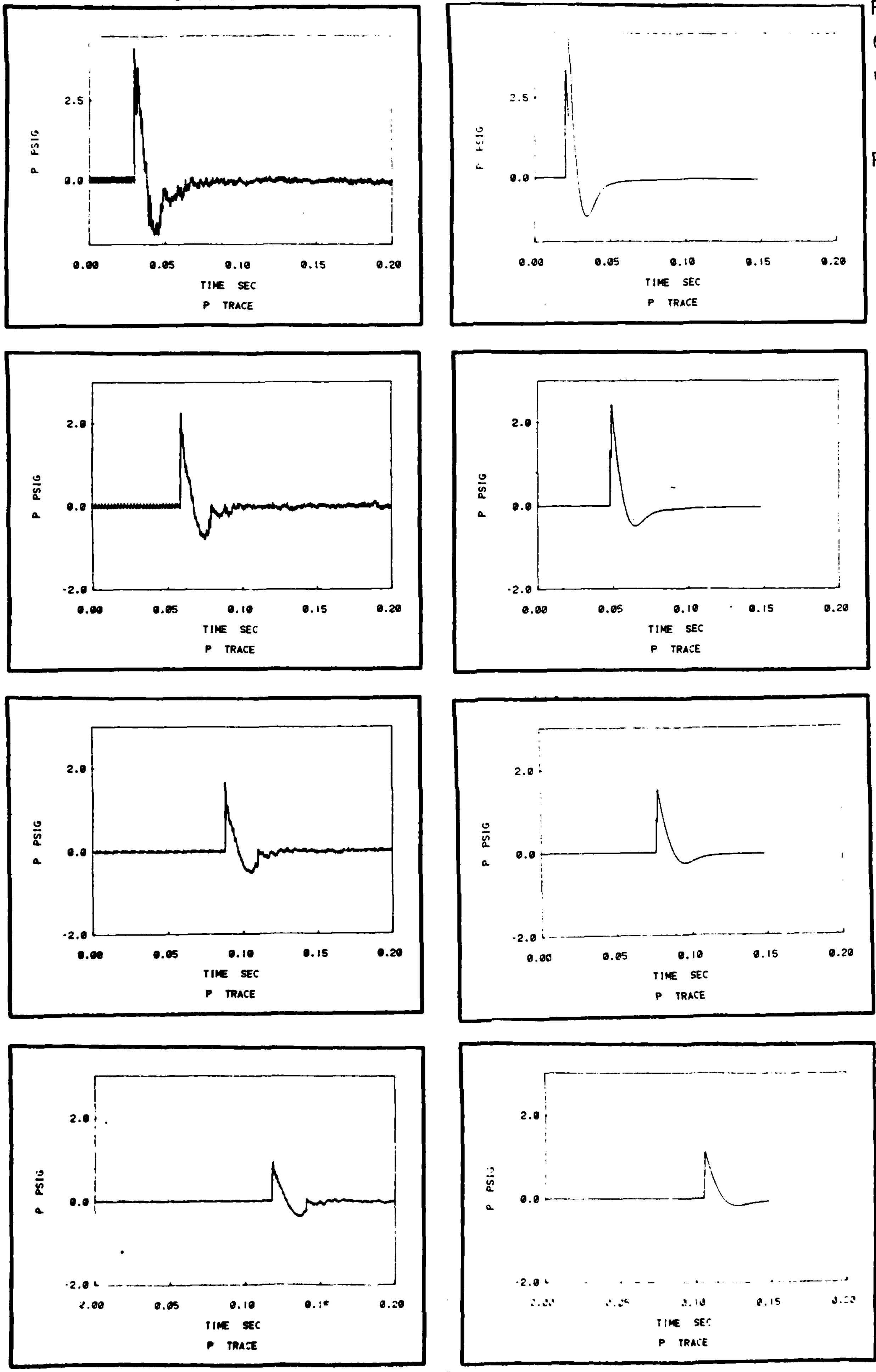
R = 40 m

Measured | Calculated

Figure 10(d)

$\theta = 15°$

$\psi = 90°$



R = 10 m

R = 20 m

R = 30 m

R = 40 m

Measured | Calculated

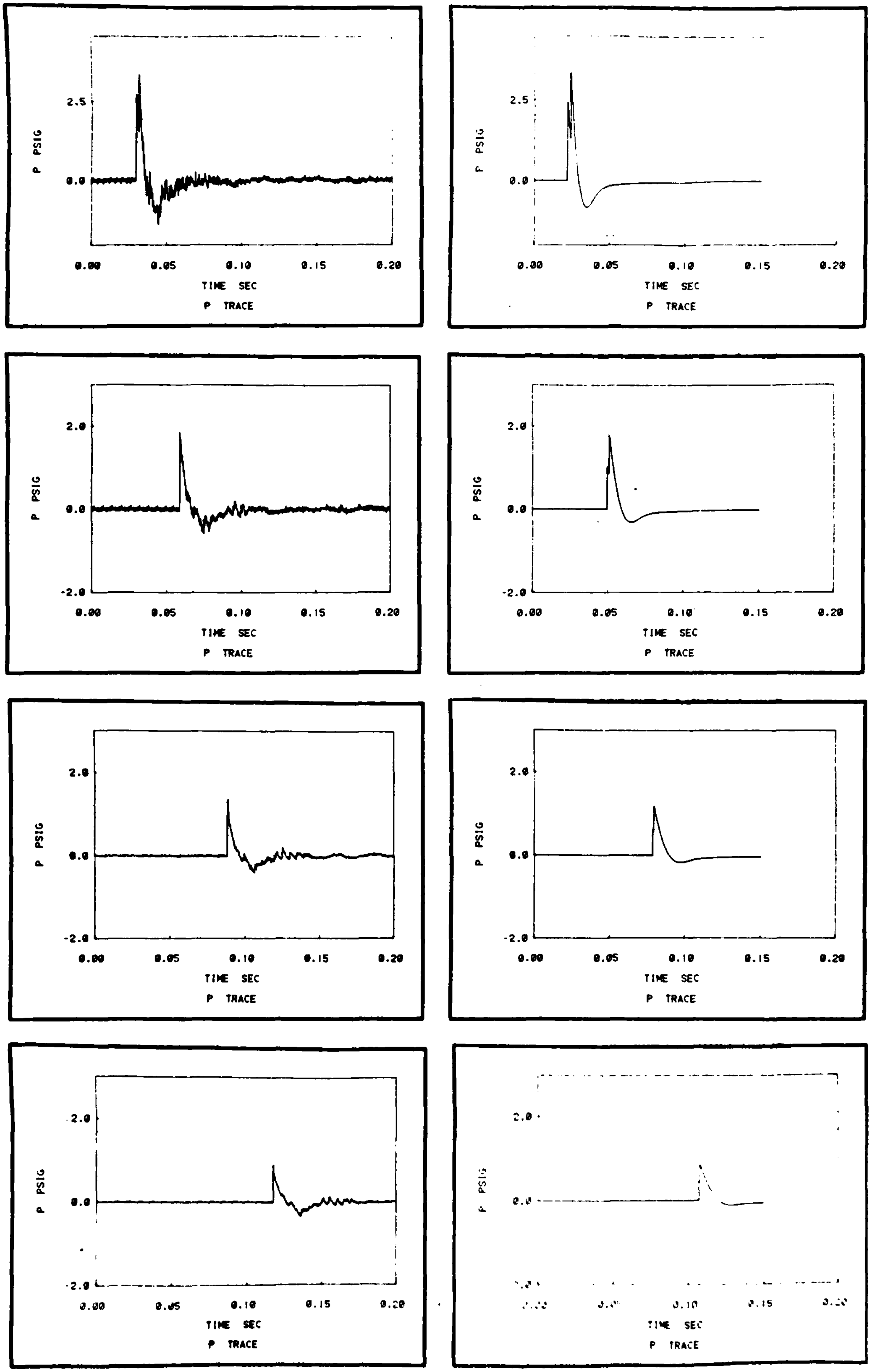


Figure 10(e

θ = 15°

ψ = 120°

R = 10 m

R = 20 m

R = 30 m

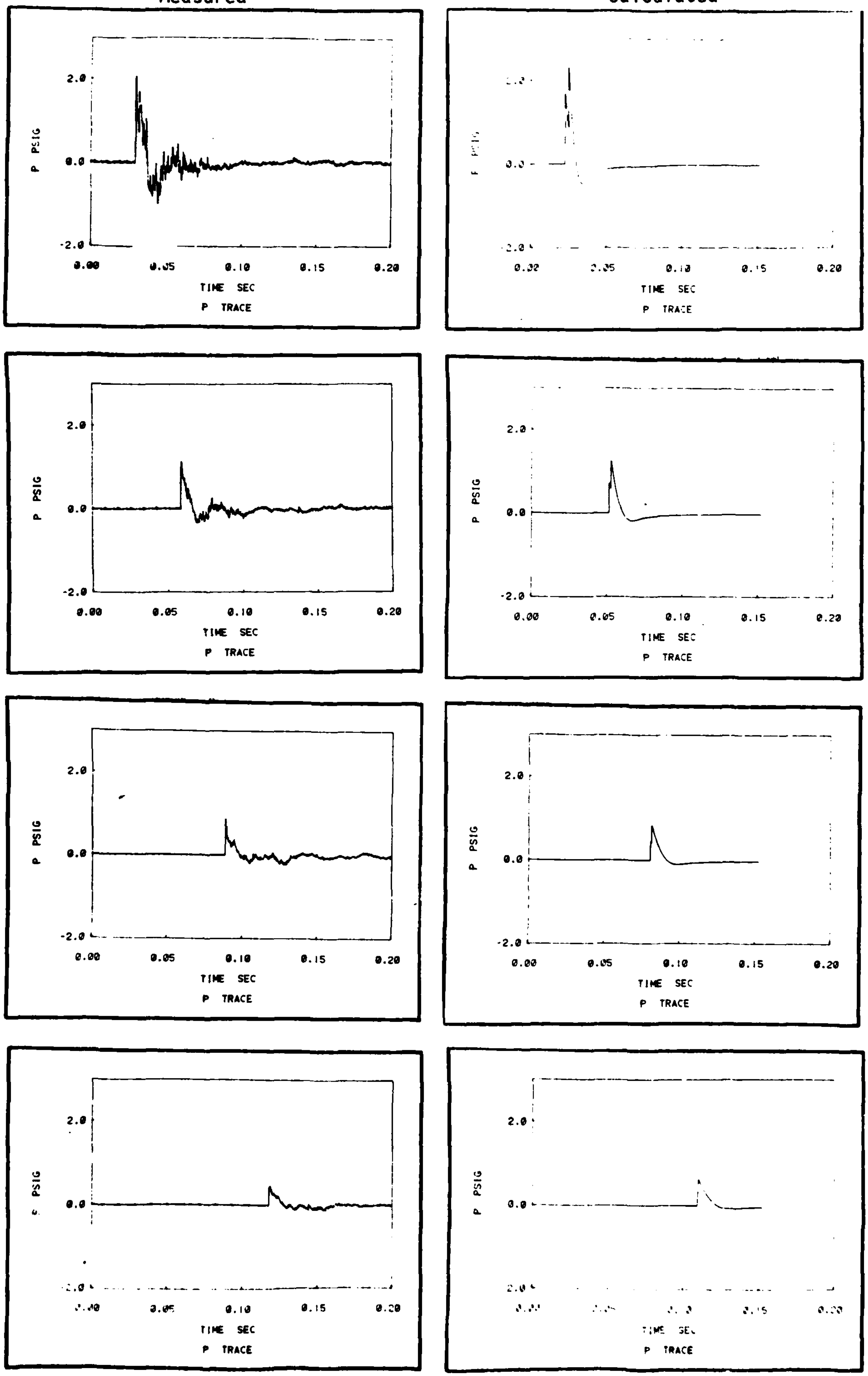
R = 40 m

Figure 10(f)

θ = 15°

ψ = 150°

Measured | Calculated



R = 10 m

R = 20 m

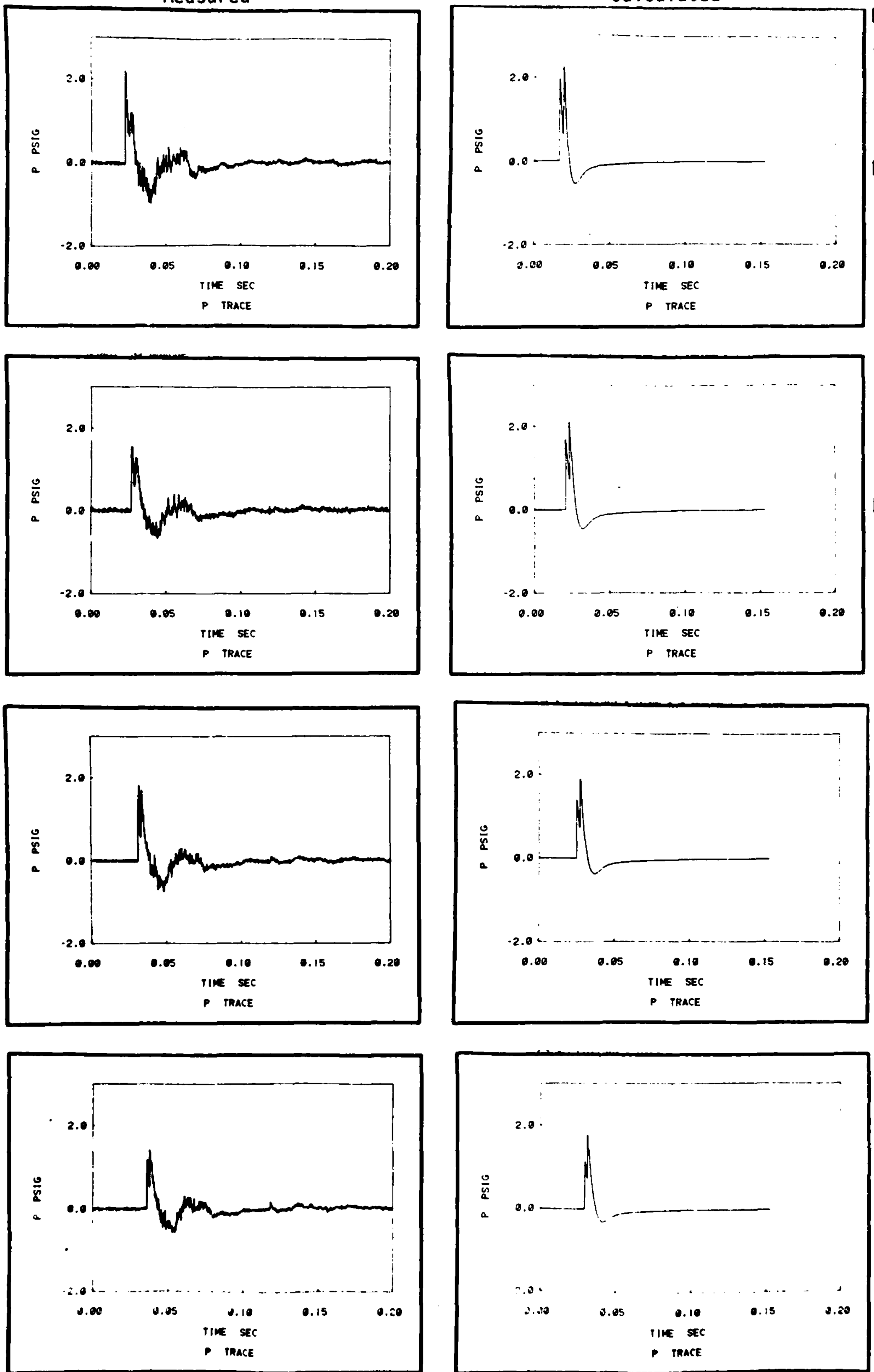
R = 30 m

R = 40 m

Figure 10(g)

$\theta = 15°$

Measured | Calculated



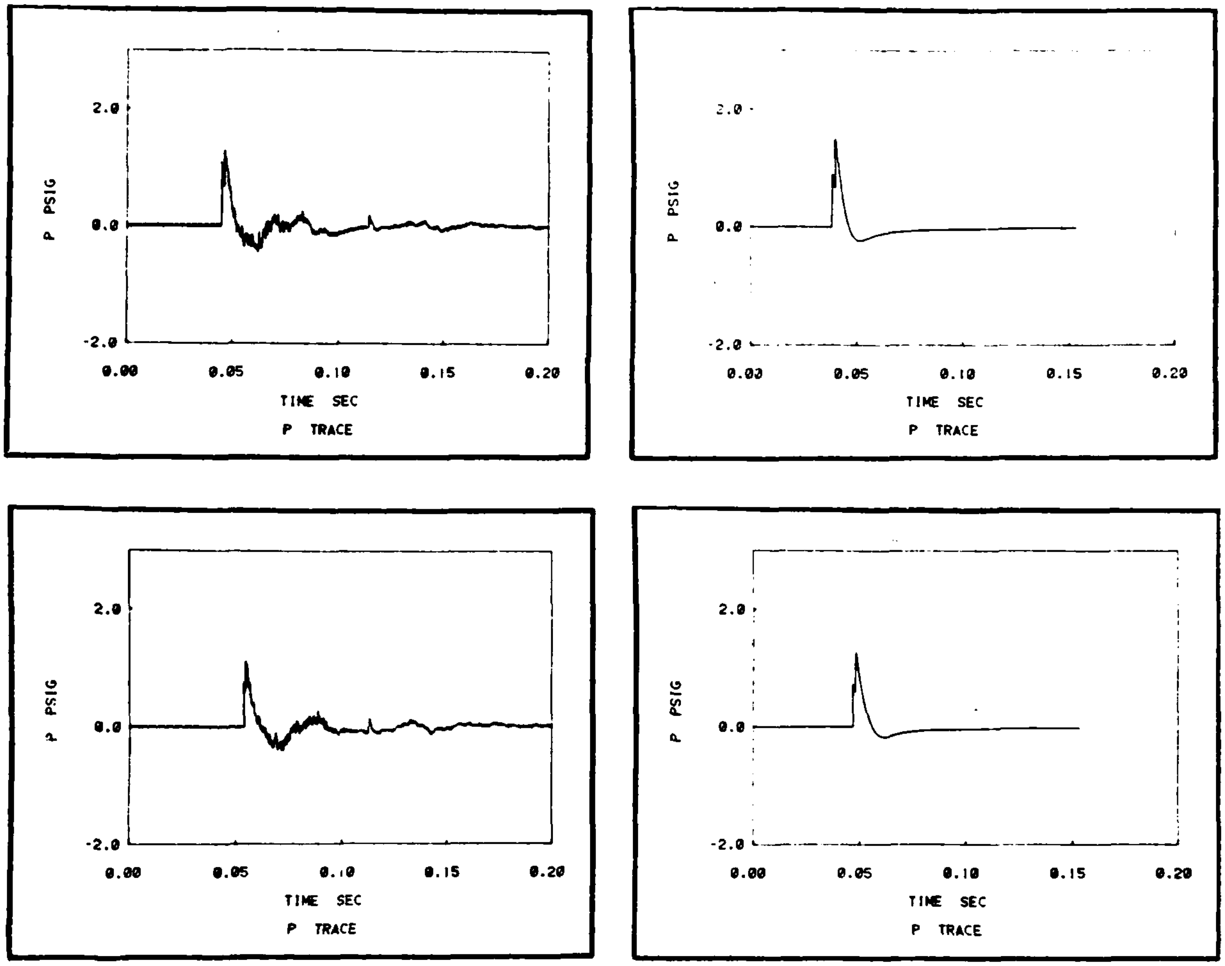
B25

B30

B35

B40

Measured | Calculated



B50

B60

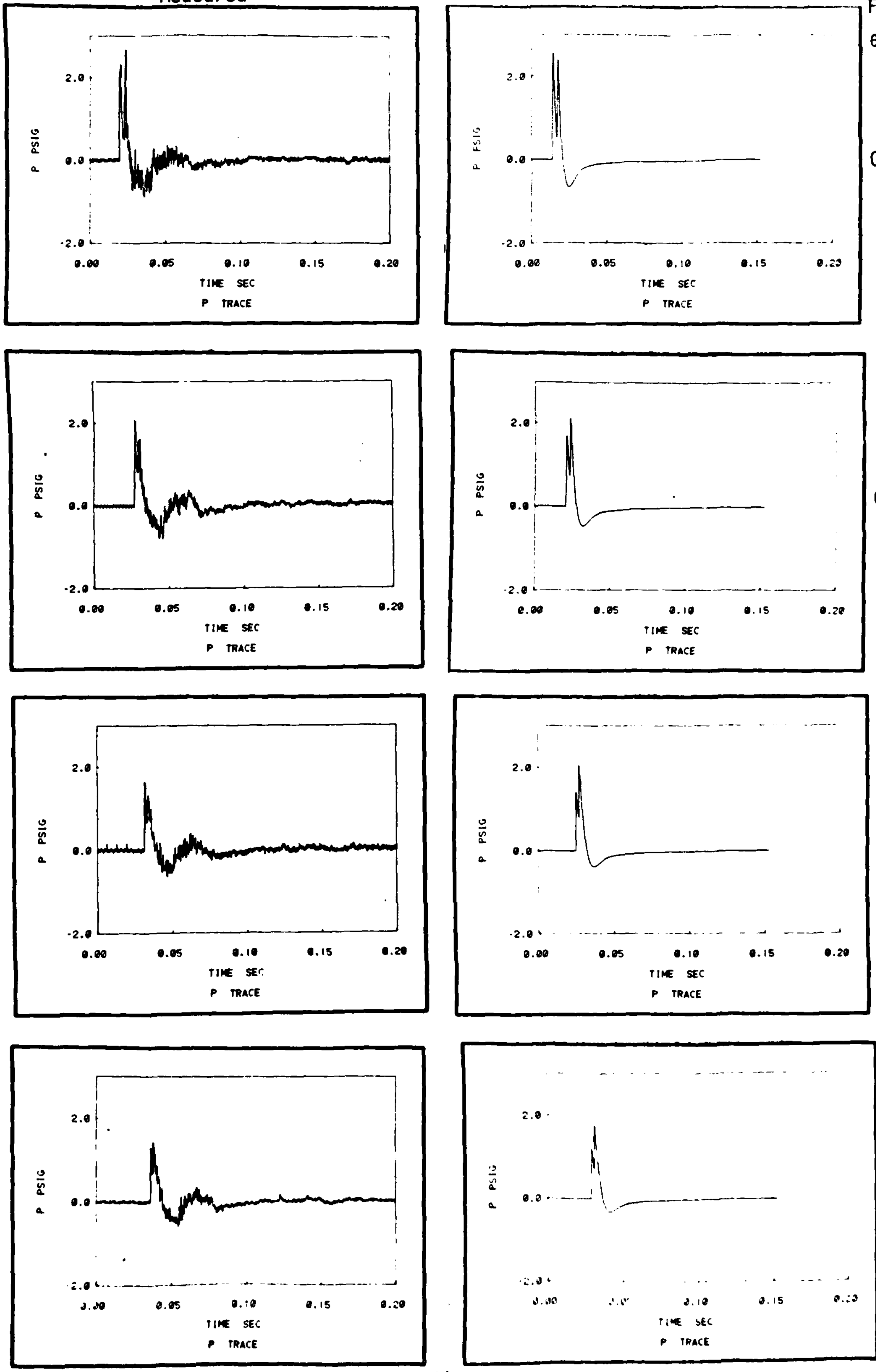
Figure 10(g)
θ = 15°
(Cont'd)

Figure 10(

$\theta = 15°$

Measured

Calculated



C22

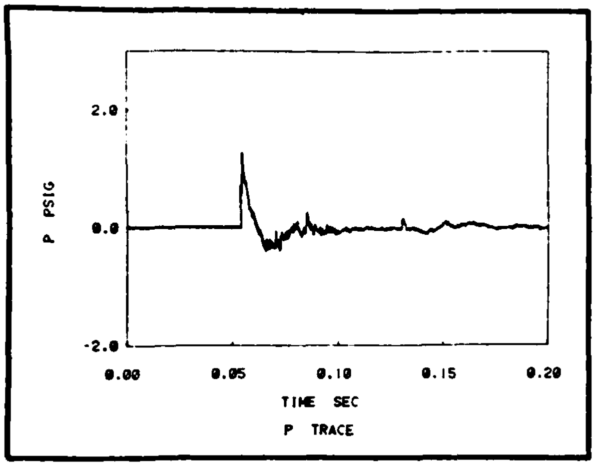
C30

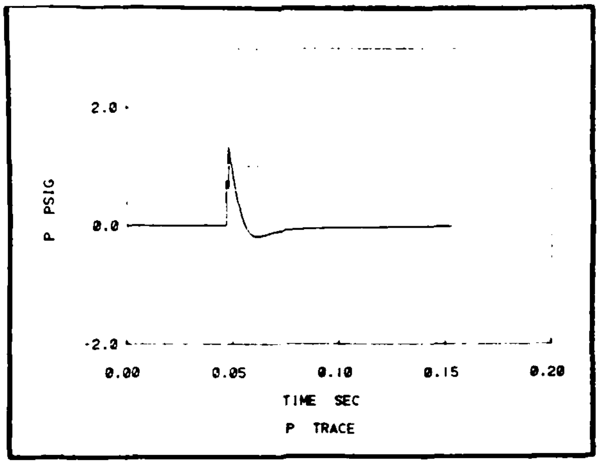
C35

C40

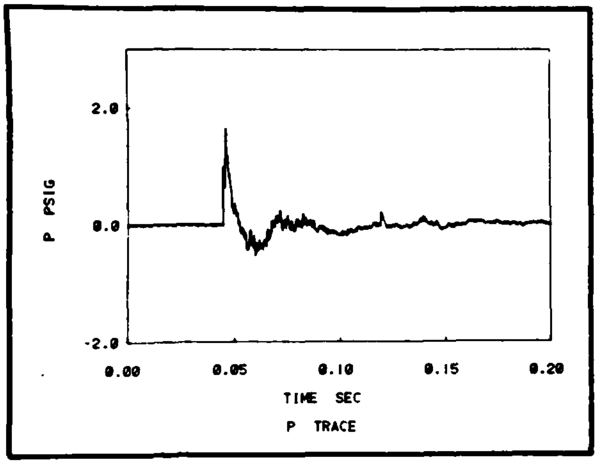
Figure 10(h) θ = 15° **(Cont'd)**

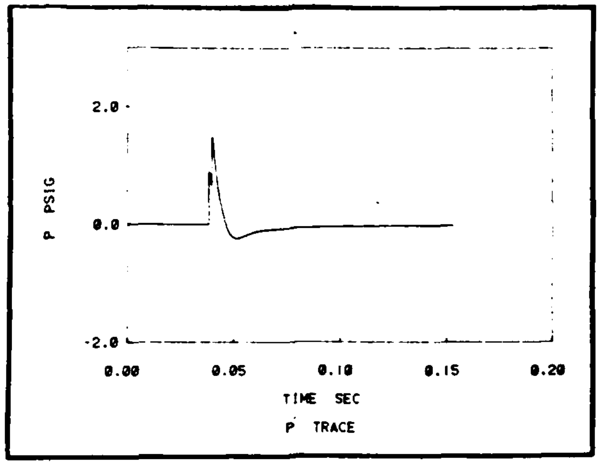
Measured | Calculated



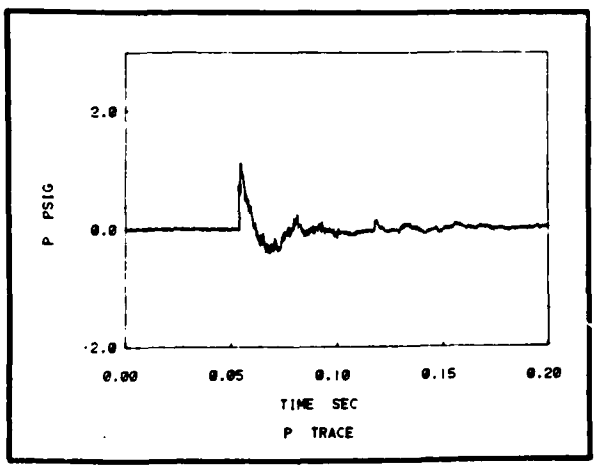


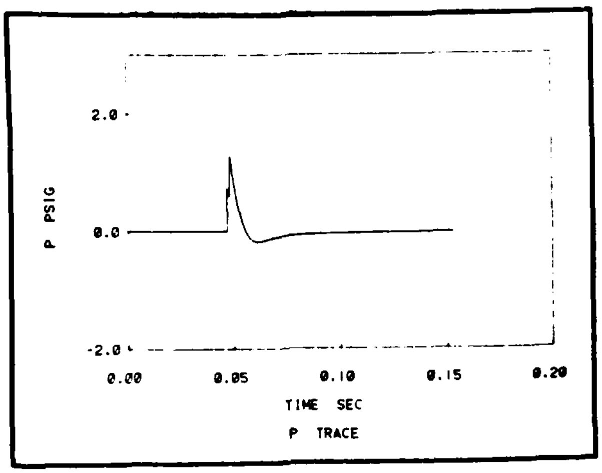
C50





C60





D60

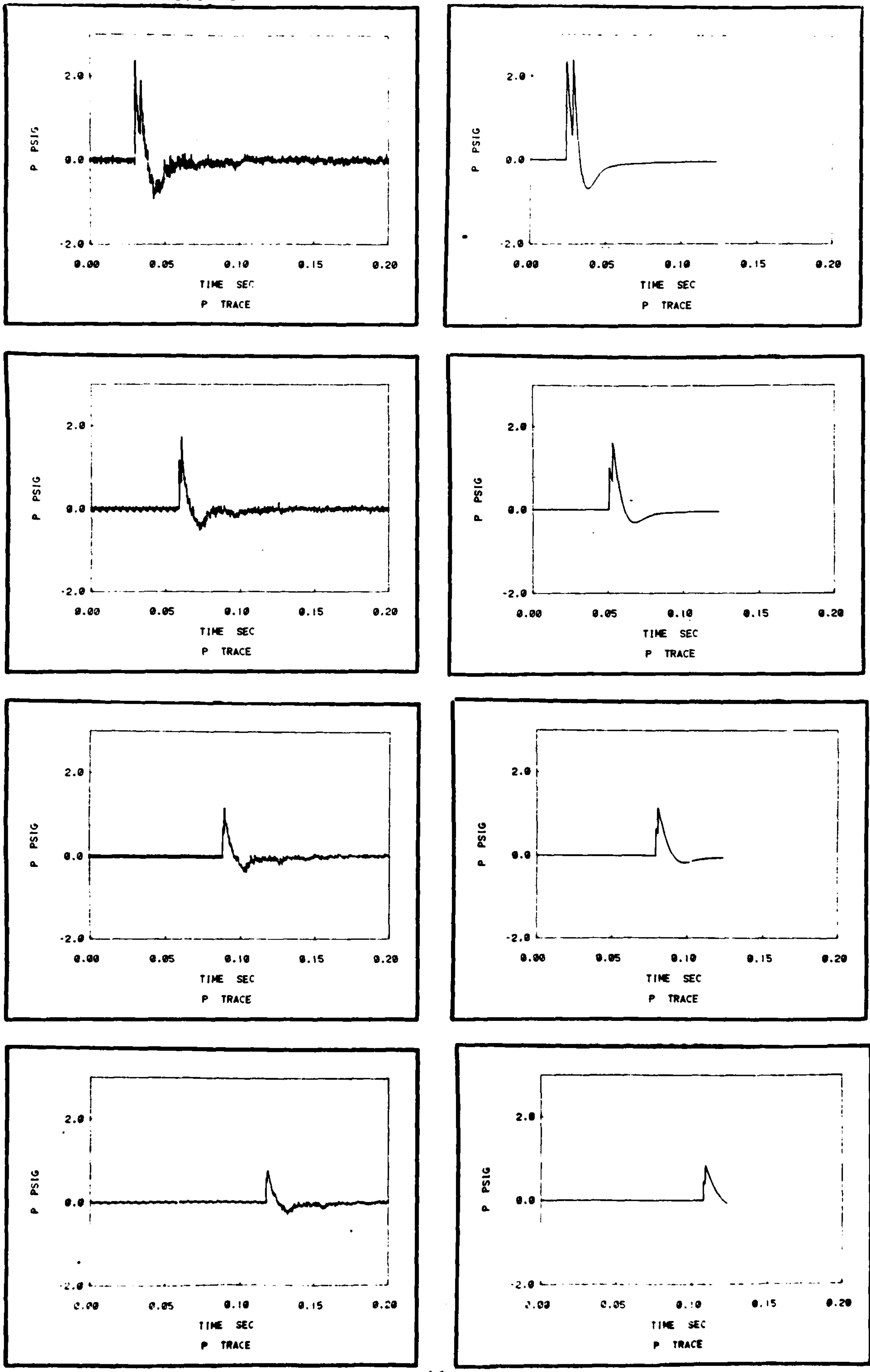
Figure 11(a

θ = 45°

ψ = 0°

Measured

Calculated



R = 10 m

R = 20 m

R = 30 m

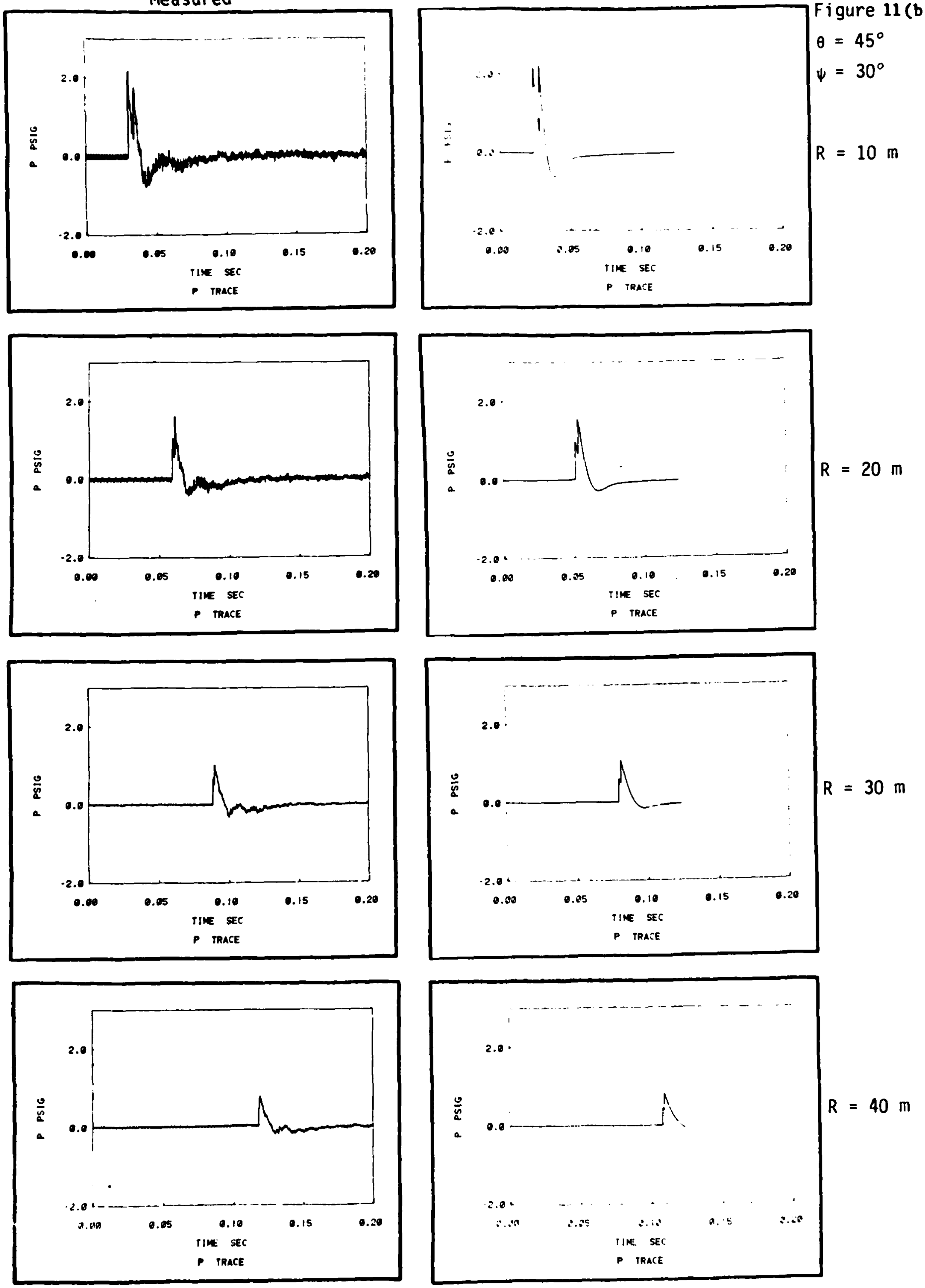
R = 40 m

Measured Calculated

Figure 11(b)

$\theta = 45°$

$\psi = 30°$

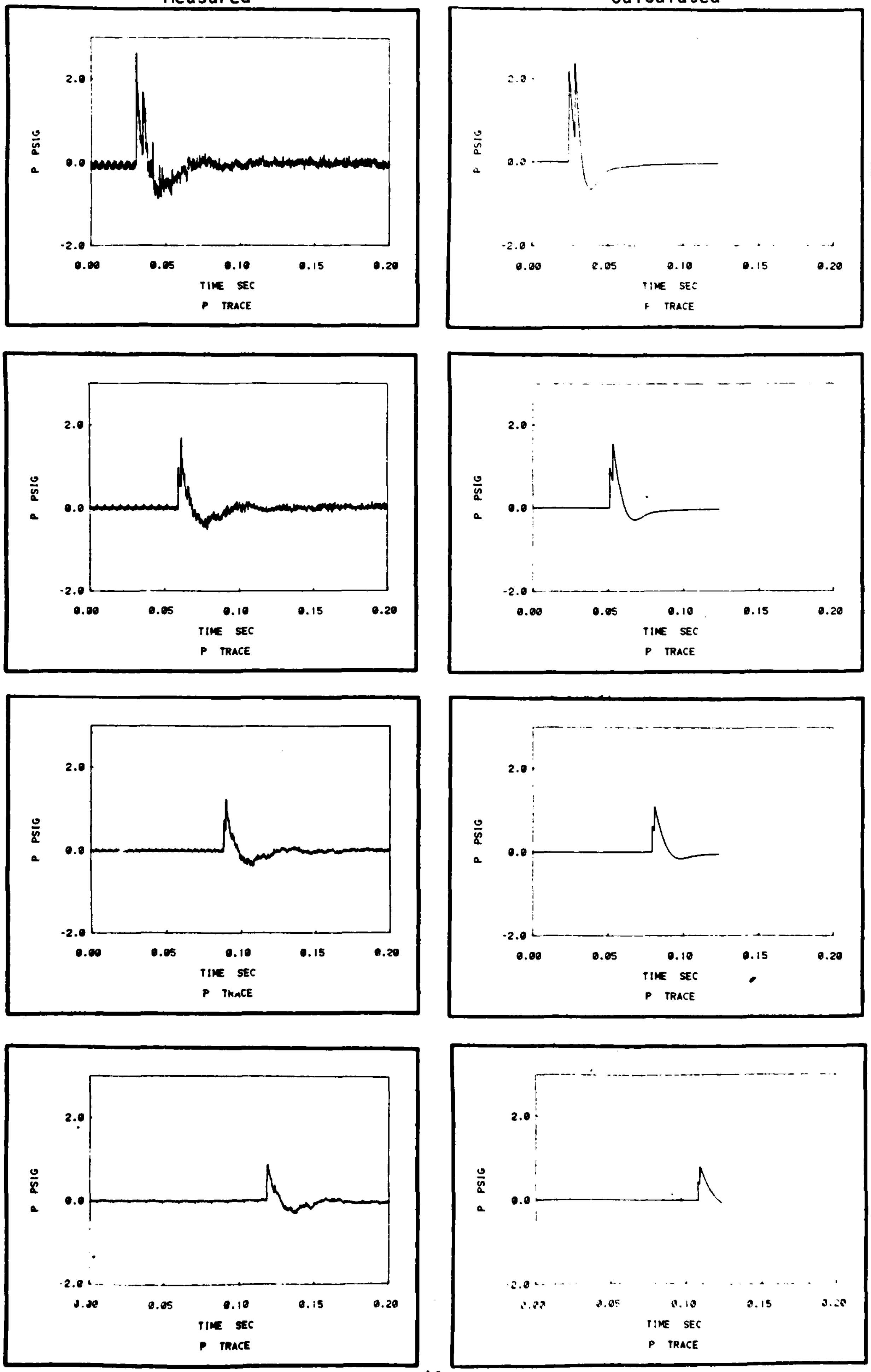


Measured | Calculated

Figure 11(c

$\theta = 45°$

$\psi = 60°$

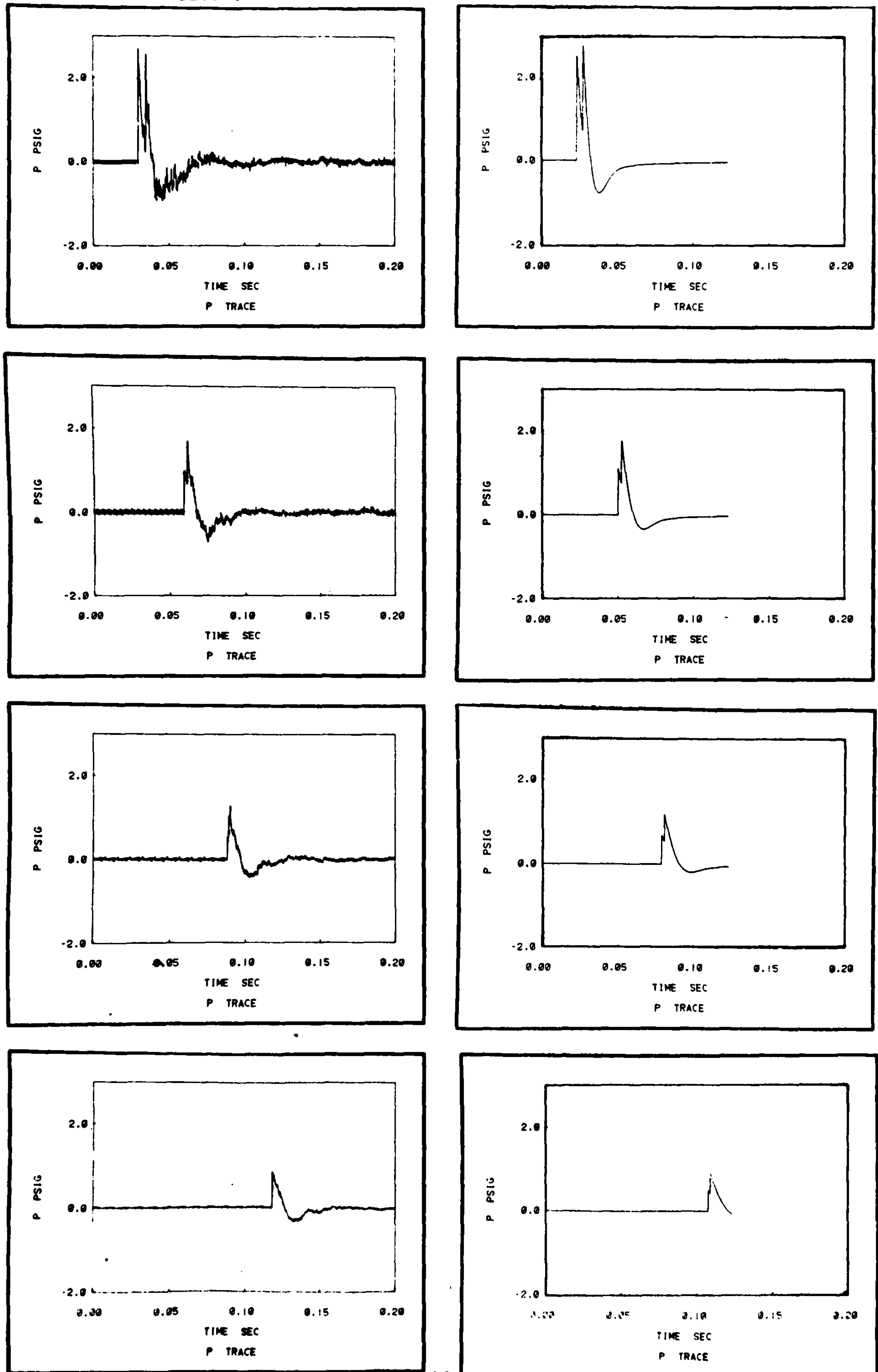


Measured — Calculated

Figure 11(d)

$\theta = 45°$

$\psi = 90°$



R = 10 m

R = 20 m

R = 30 m

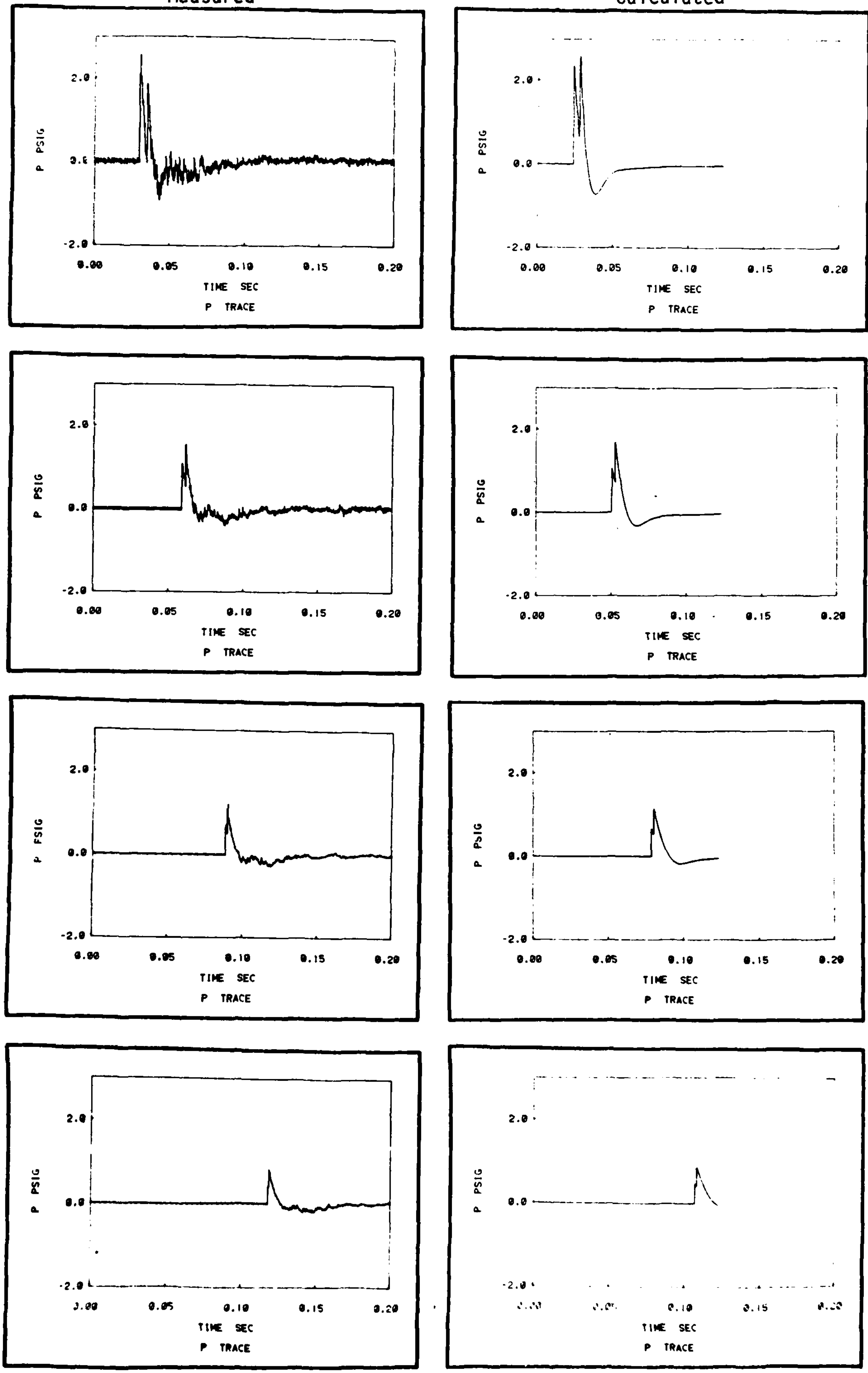
R = 40 m

Measured | Calculated

Figure 11(e–

$\theta = 45°$

$\psi = 120°$



R = 10 m

R = 20 m

R = 30 m

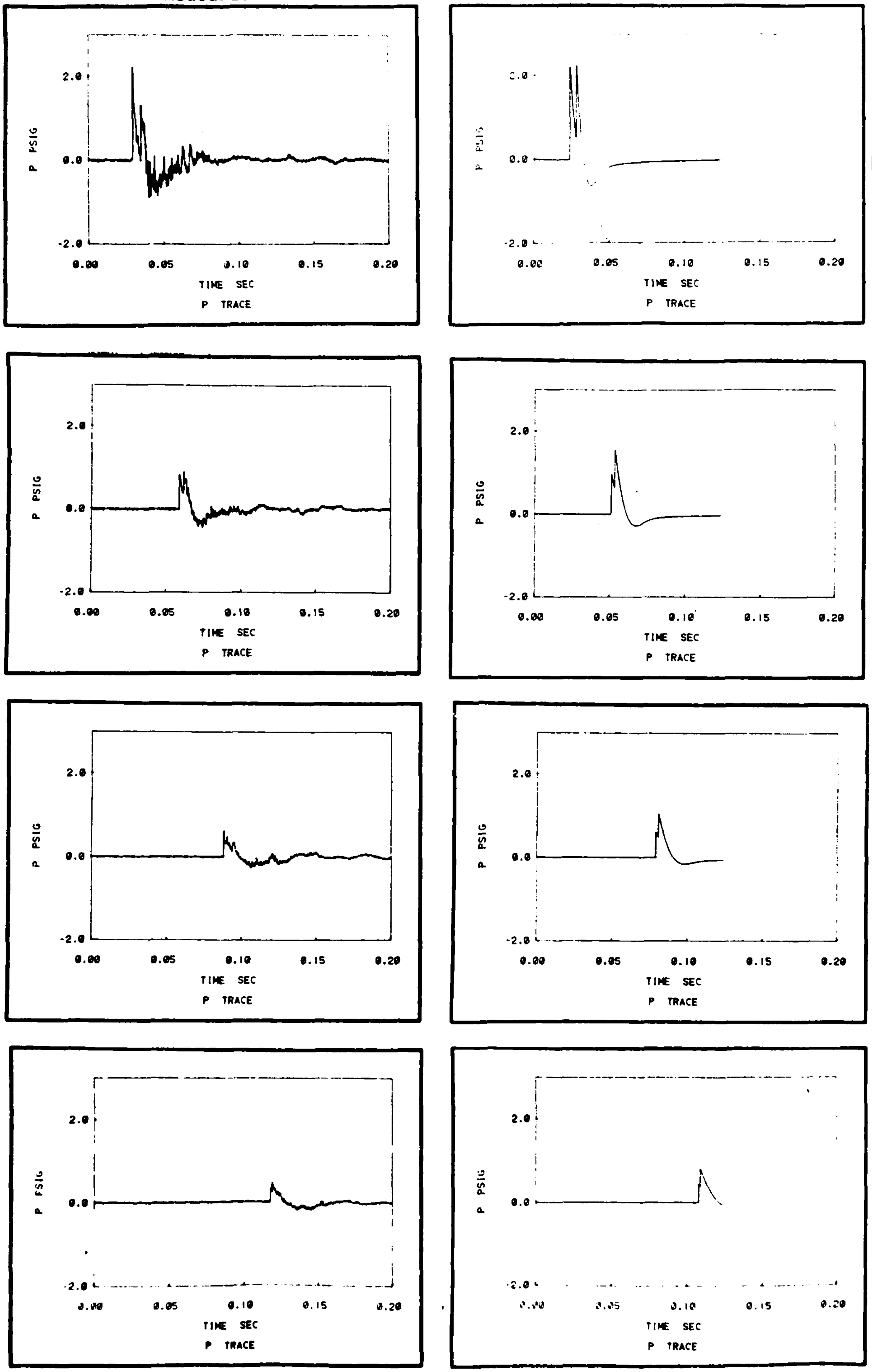
R = 40 m

Measured Calculated

Figure 11(f)

$\theta = 45°$

$\psi = 150°$



R = 10 m

R = 20 m

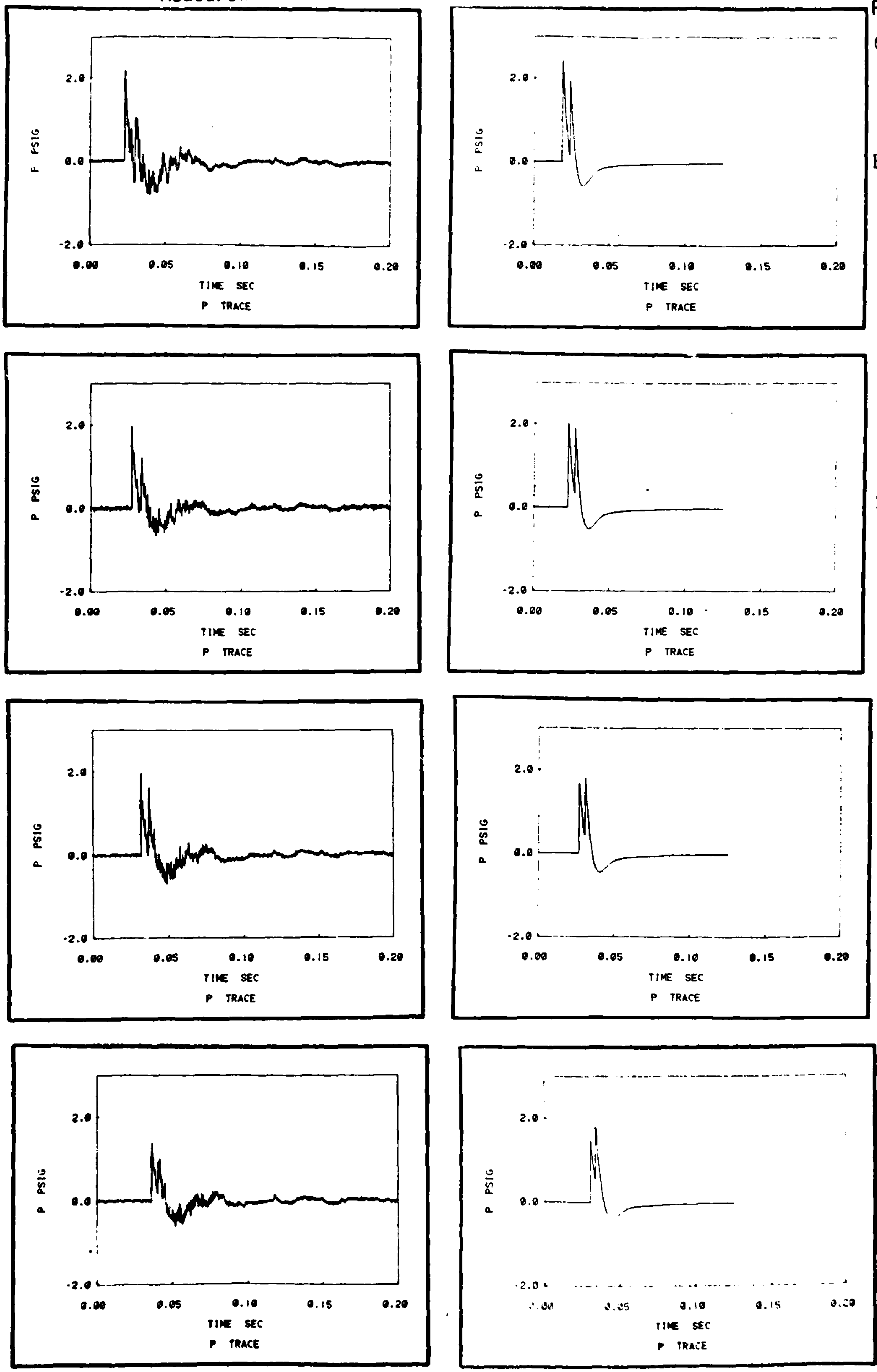
R = 30 m

R = 40 m

Measured | Calculated

Figure 11(g)

$\theta = 45°$



B25

B30

B35

B40

Measured   Calculated

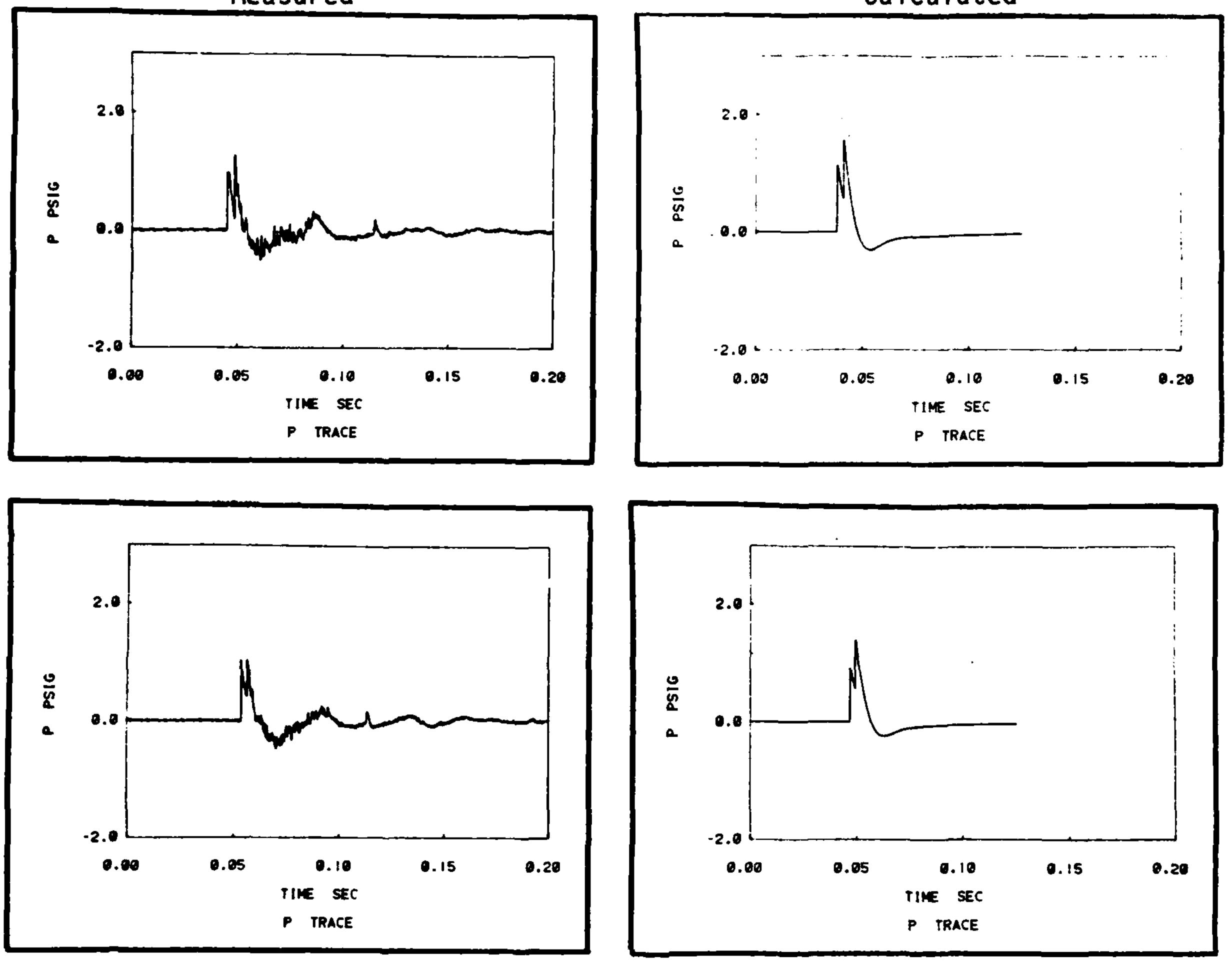


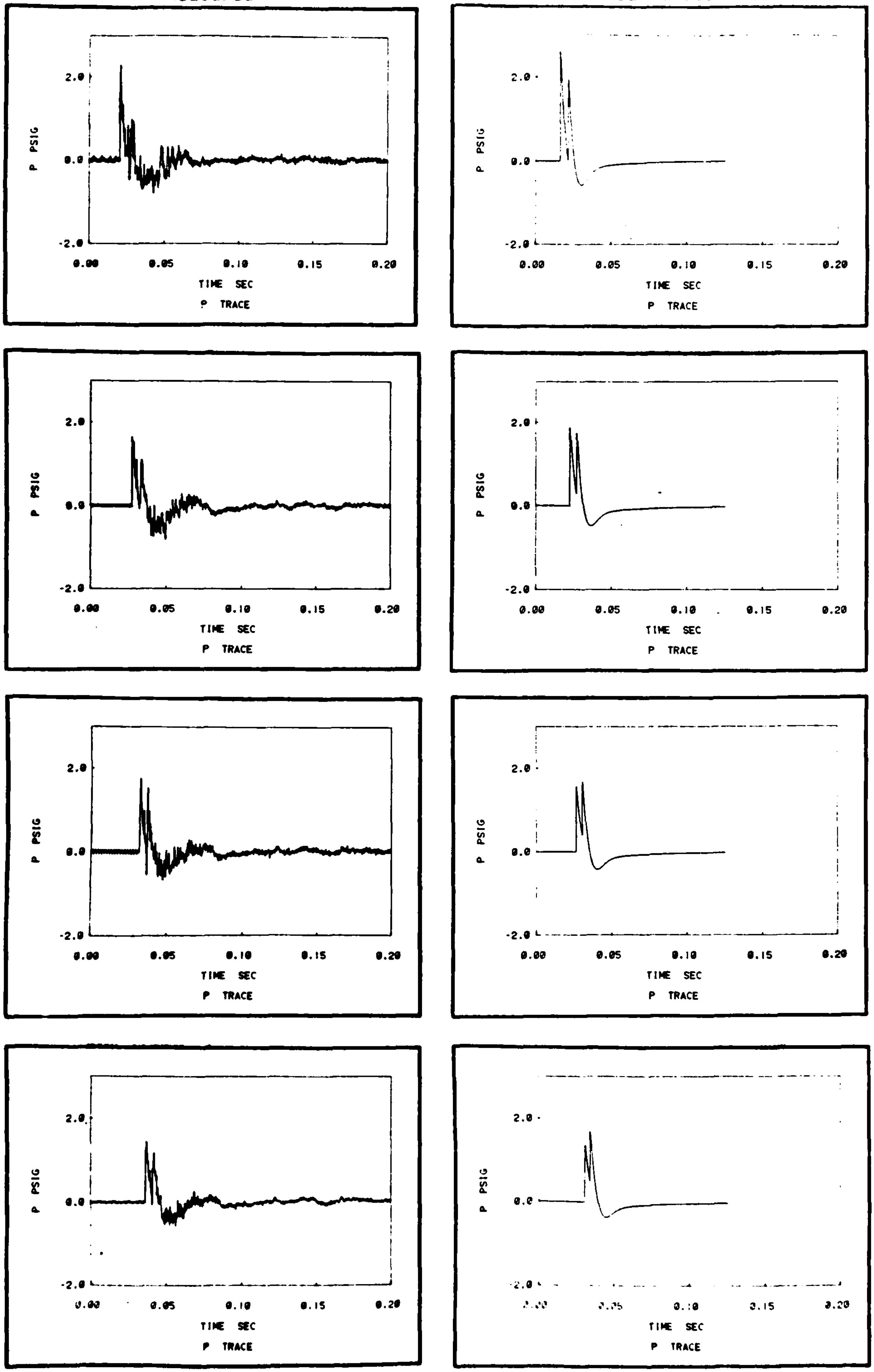
Figure 11(g)
θ = 45°
(Cont'd)

B50

B60

Measured | Calculated

Figure 11(h)
θ = 45°



C22

C30

C35

C40

Measured Calculated

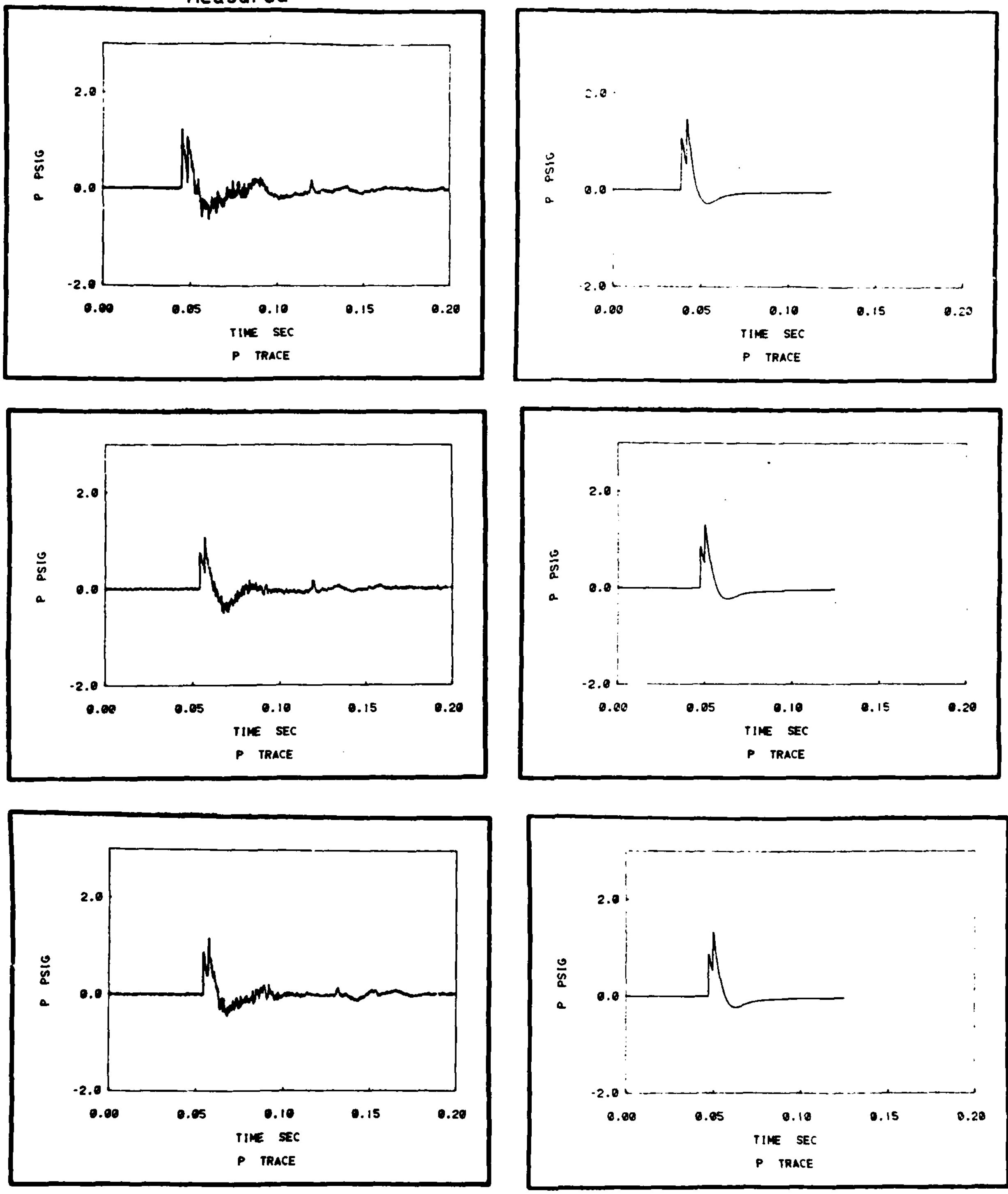


Figure 11(h)
$\theta = 45°$
(Cont'd)

Figure 12(a)

θ = 2.53°

Incident Pressure Pulse, p_1

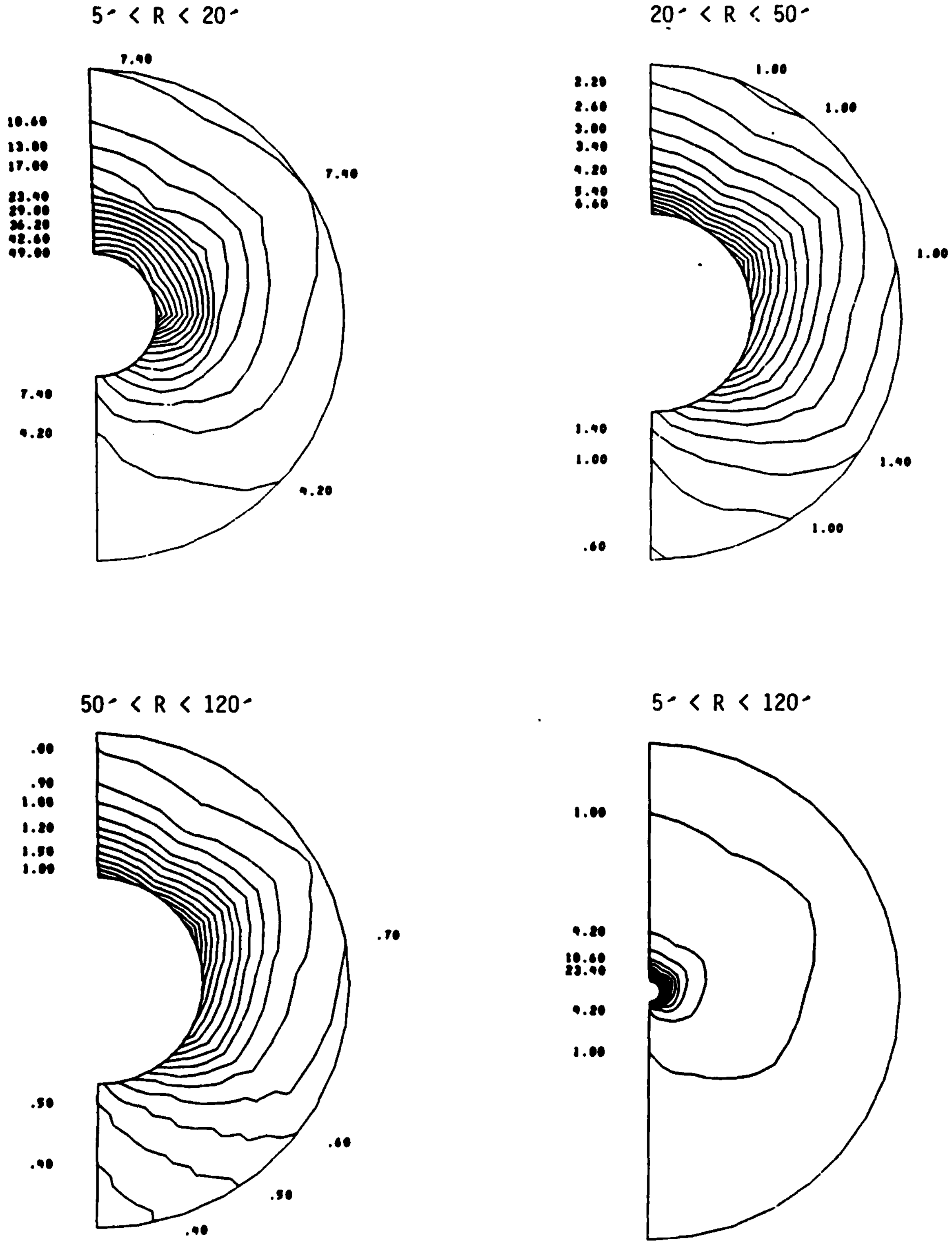


Figure 12(b)

$\theta = 2.53°$

Reflected Pressure Pulse, p_2

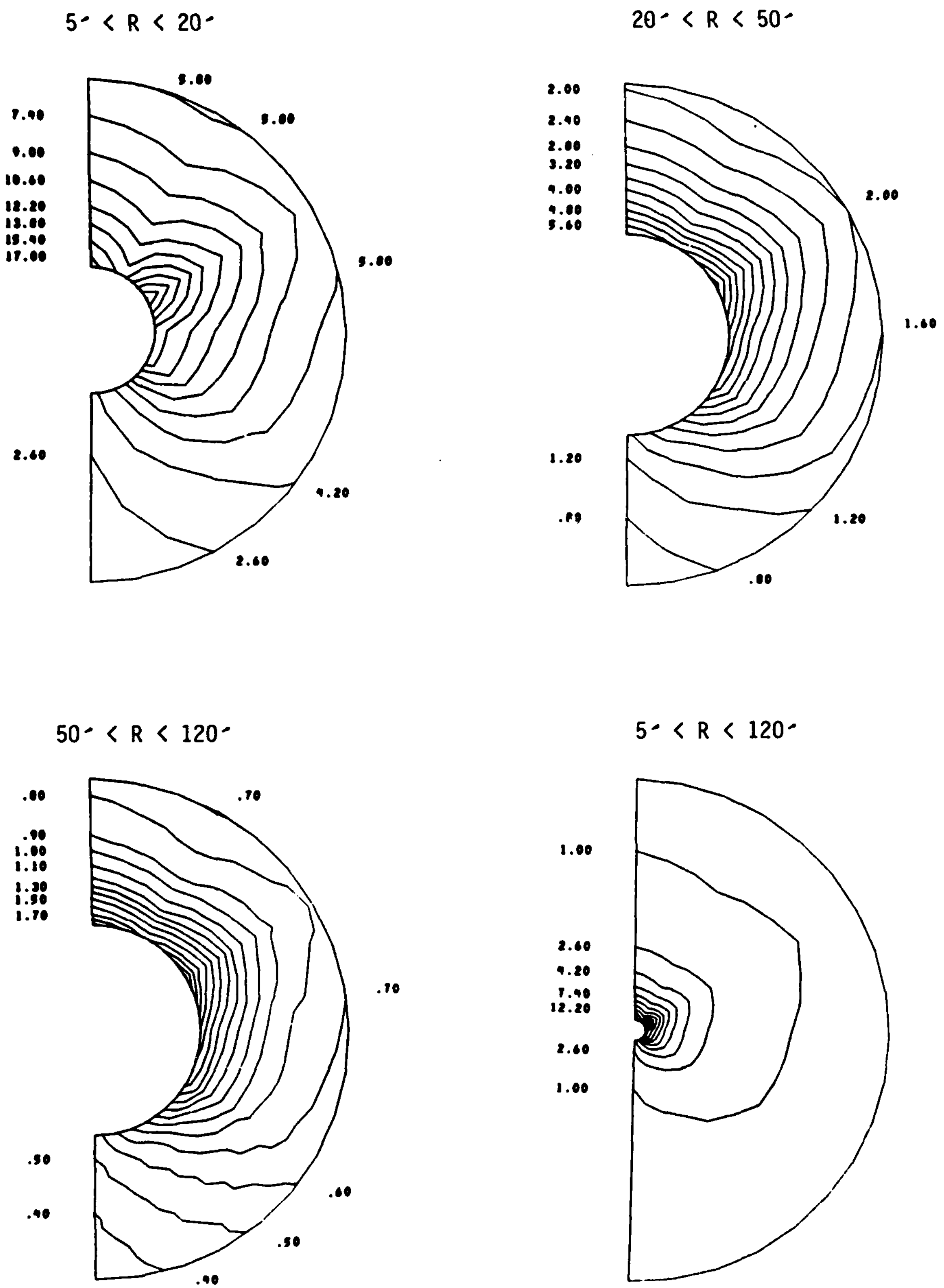


Figure 12(c)

$\theta = 2.53°$

Static Pressure, p_{stat}

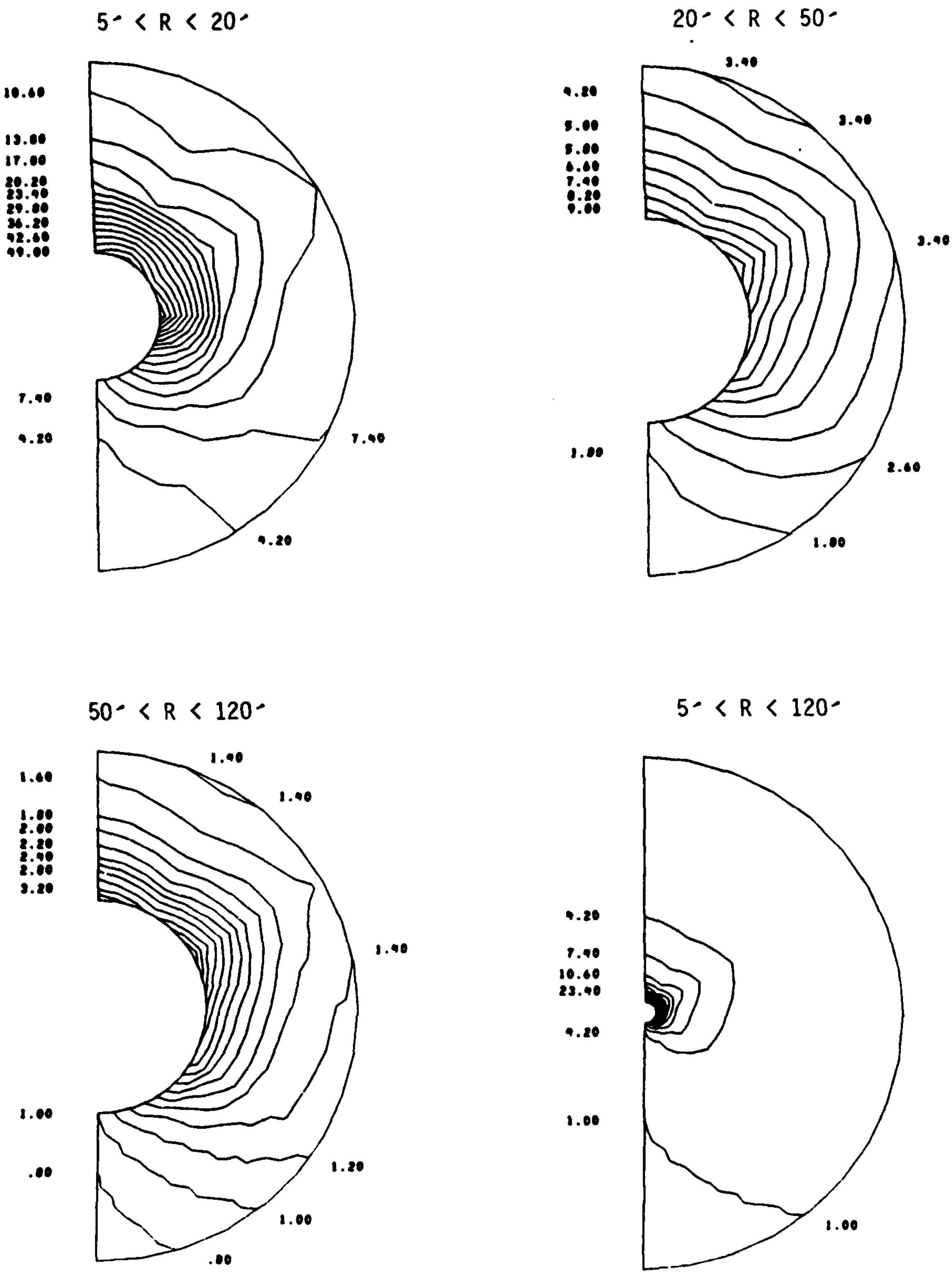


Figure 12(d)

$\theta = 2.53°$

Dynamic Pressure, p_{dyn}

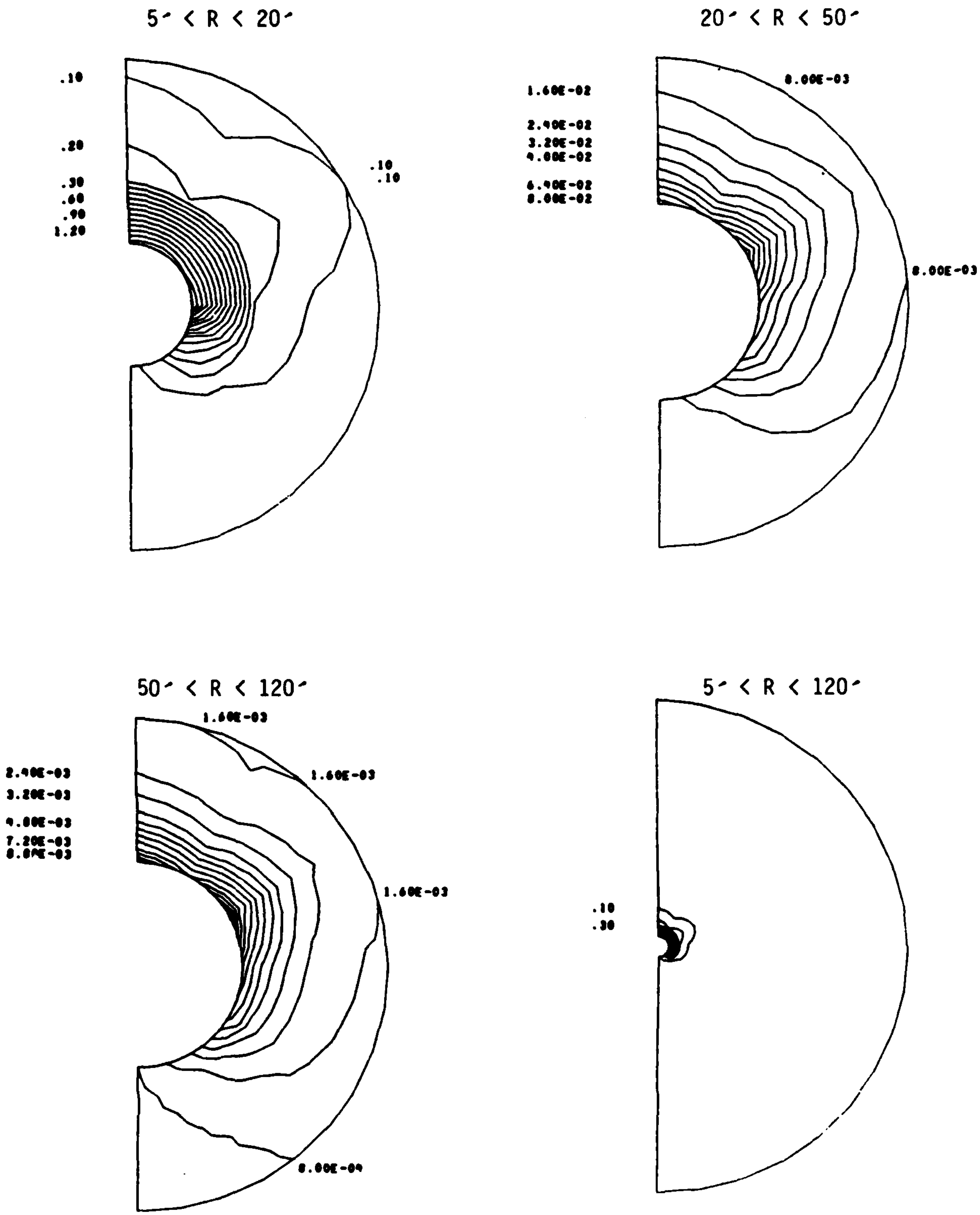


Figure 12(e)

$\theta = 2.53°$

A-Duration, A_{dur}

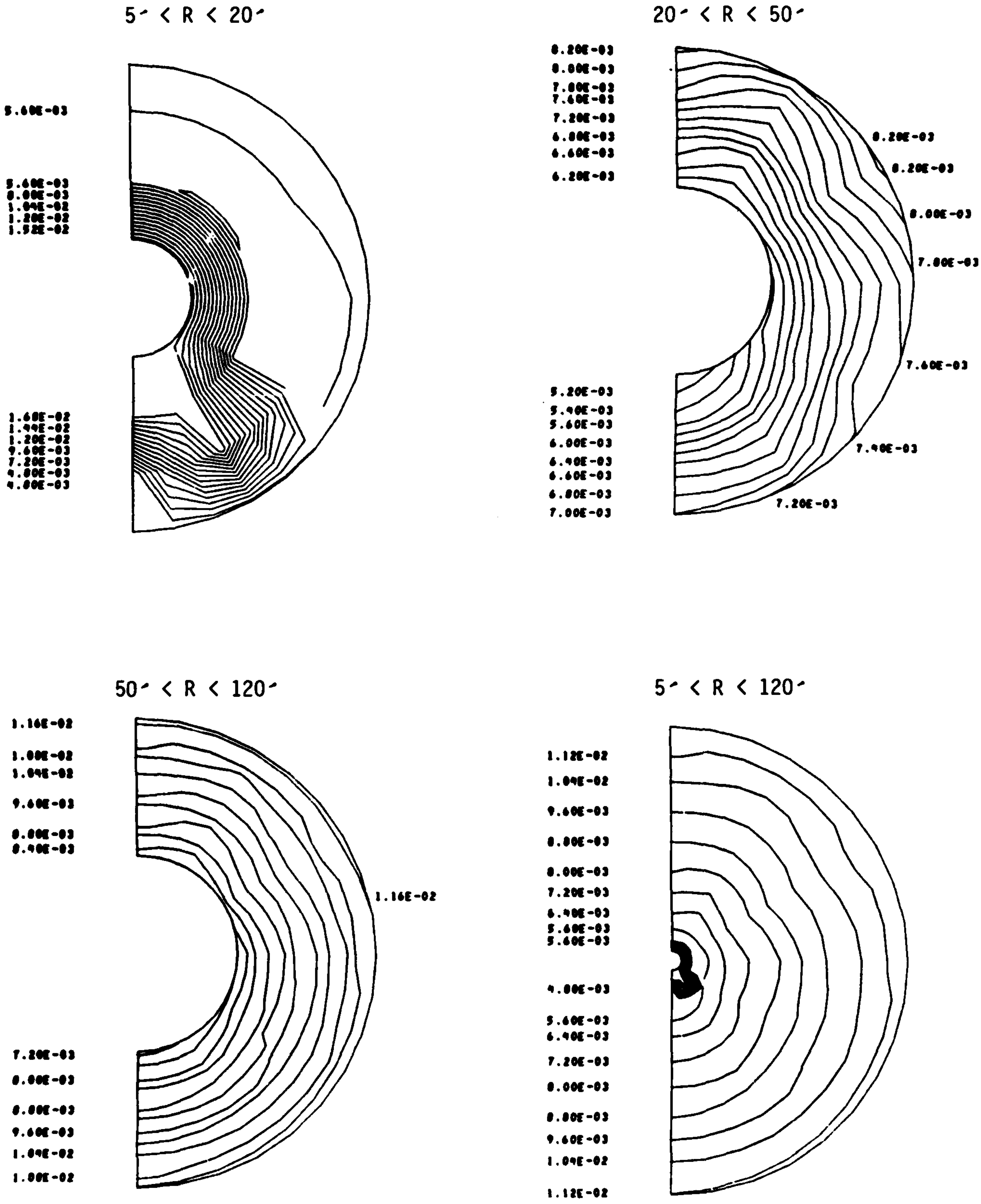


Figure 12(f)

$\theta = 2.53°$

A-Impulse, A_{imp}

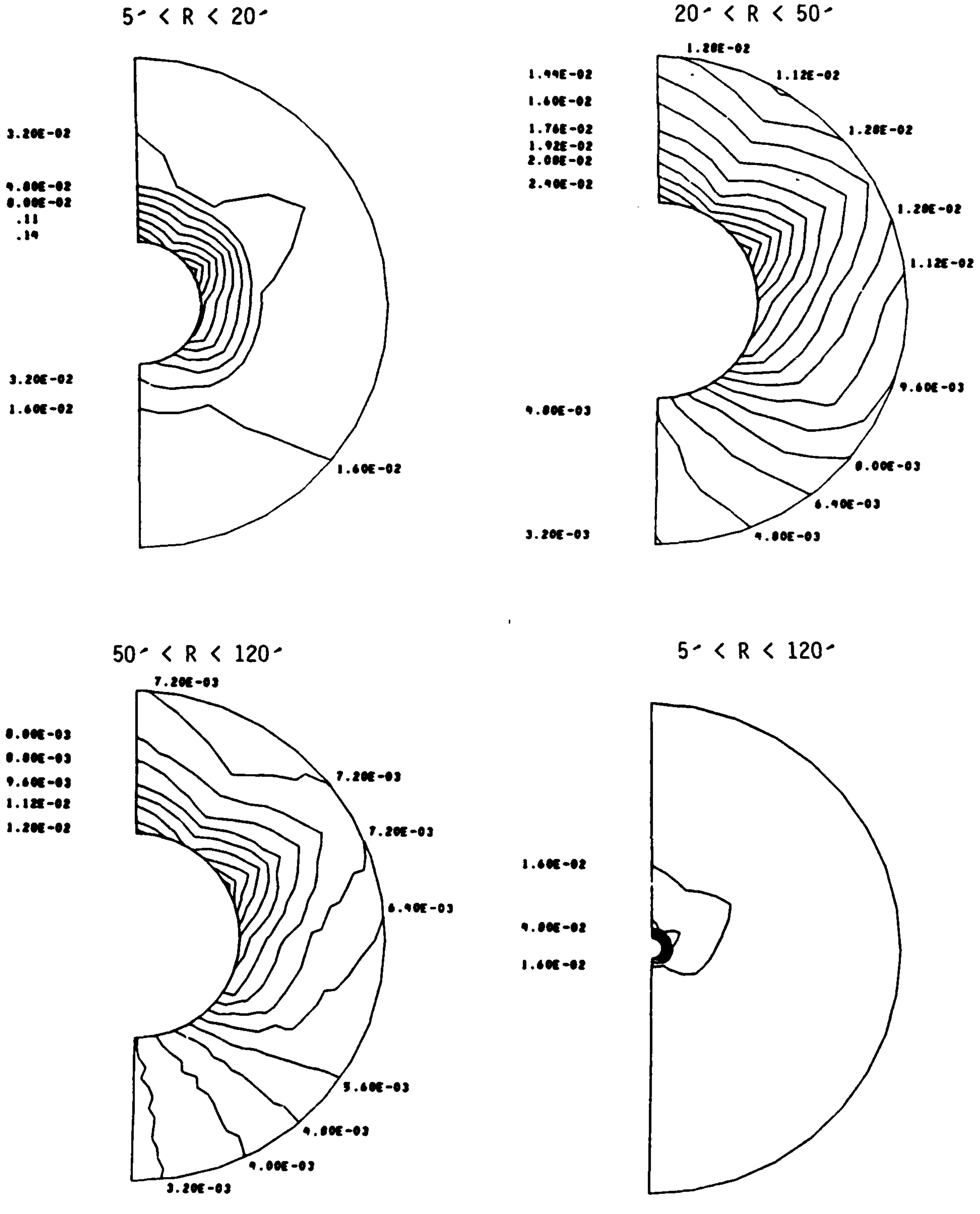


Figure 13(a)
θ = 15°

Incident Pressure Pulse, p_1

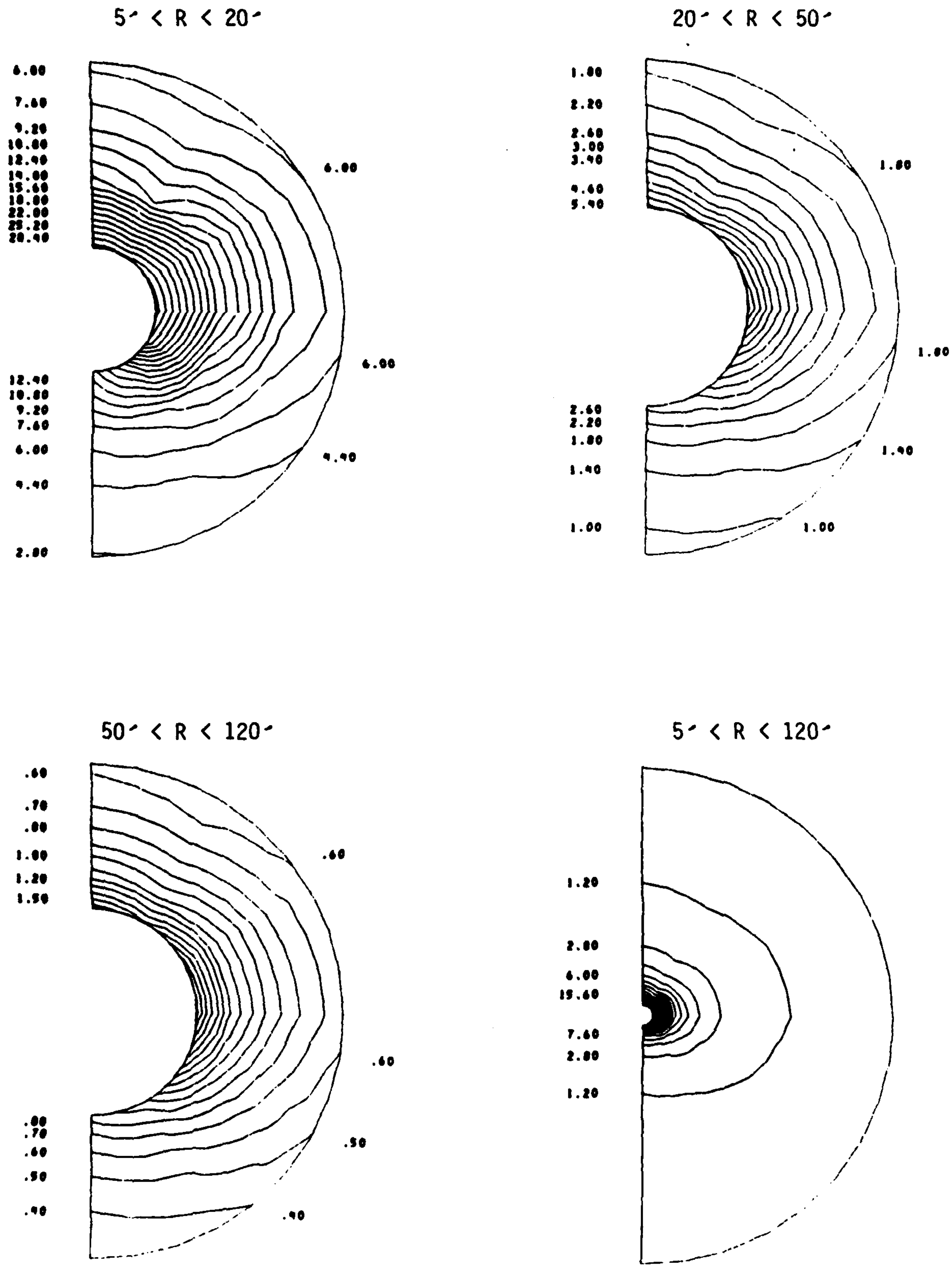


Figure 13(b)

$\theta = 15°$

Reflected Pressure Pulse, p_2

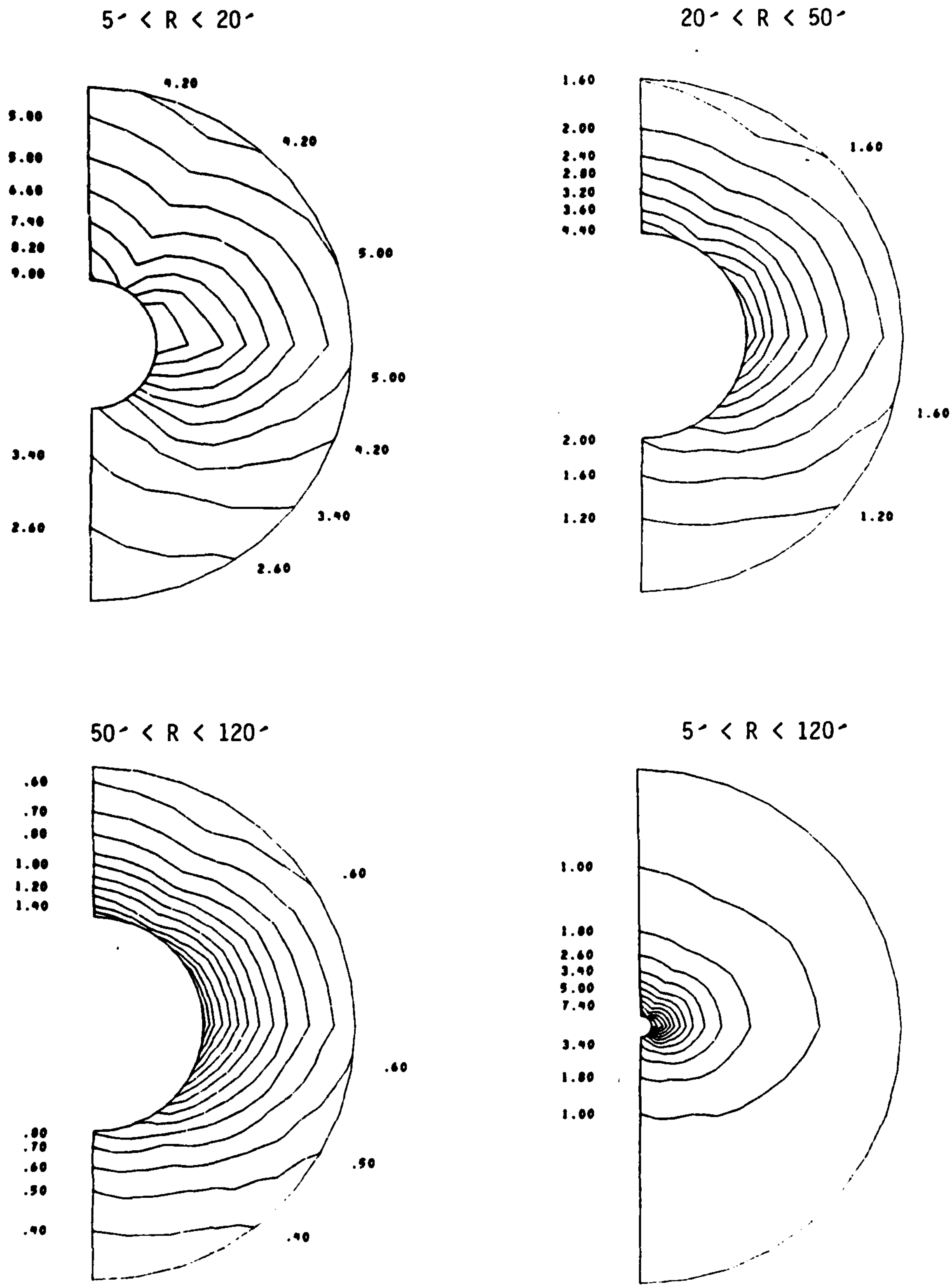


Figure 13(c)
$\theta = 15°$

Static Pressure, p_{stat}

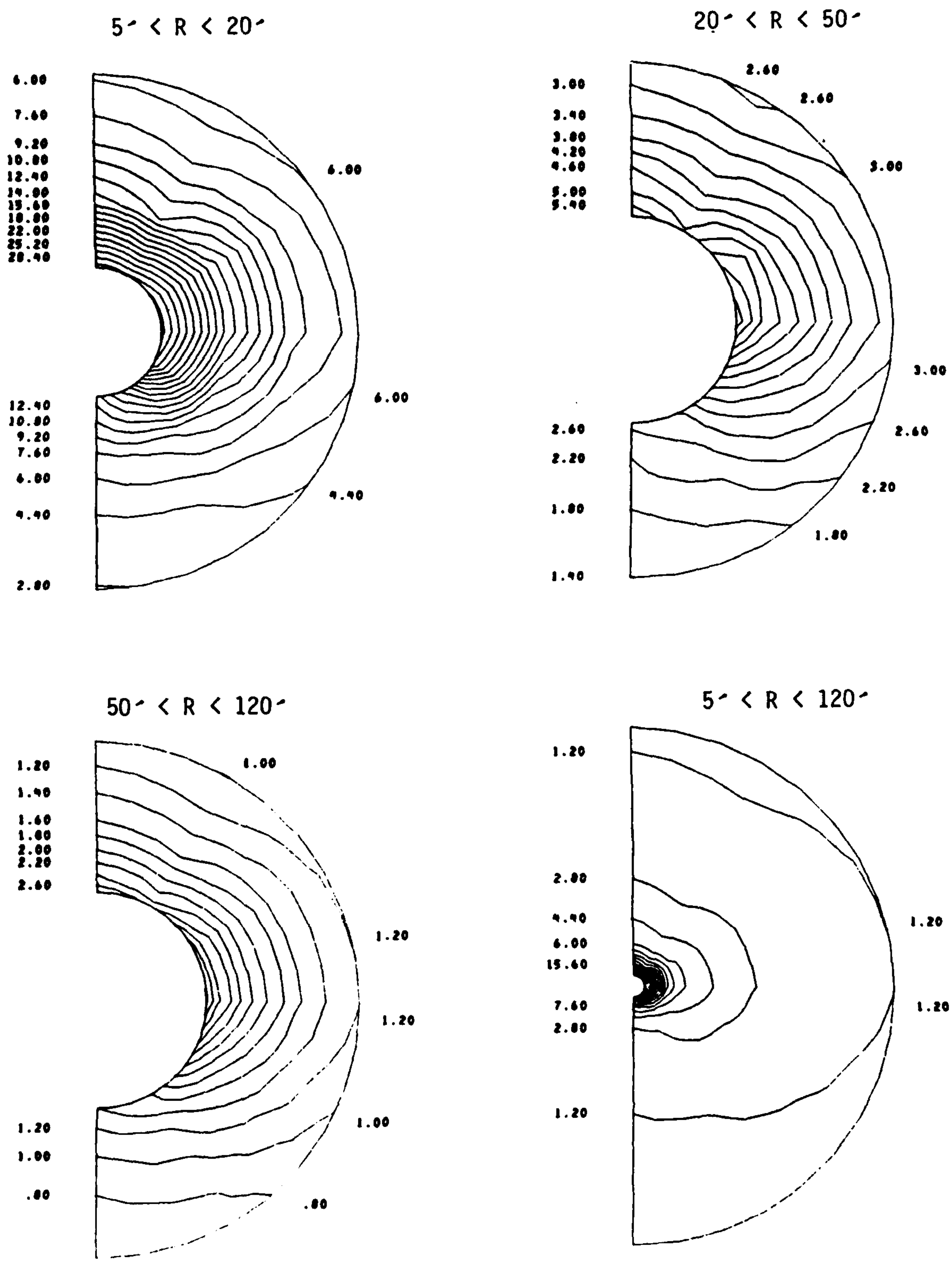
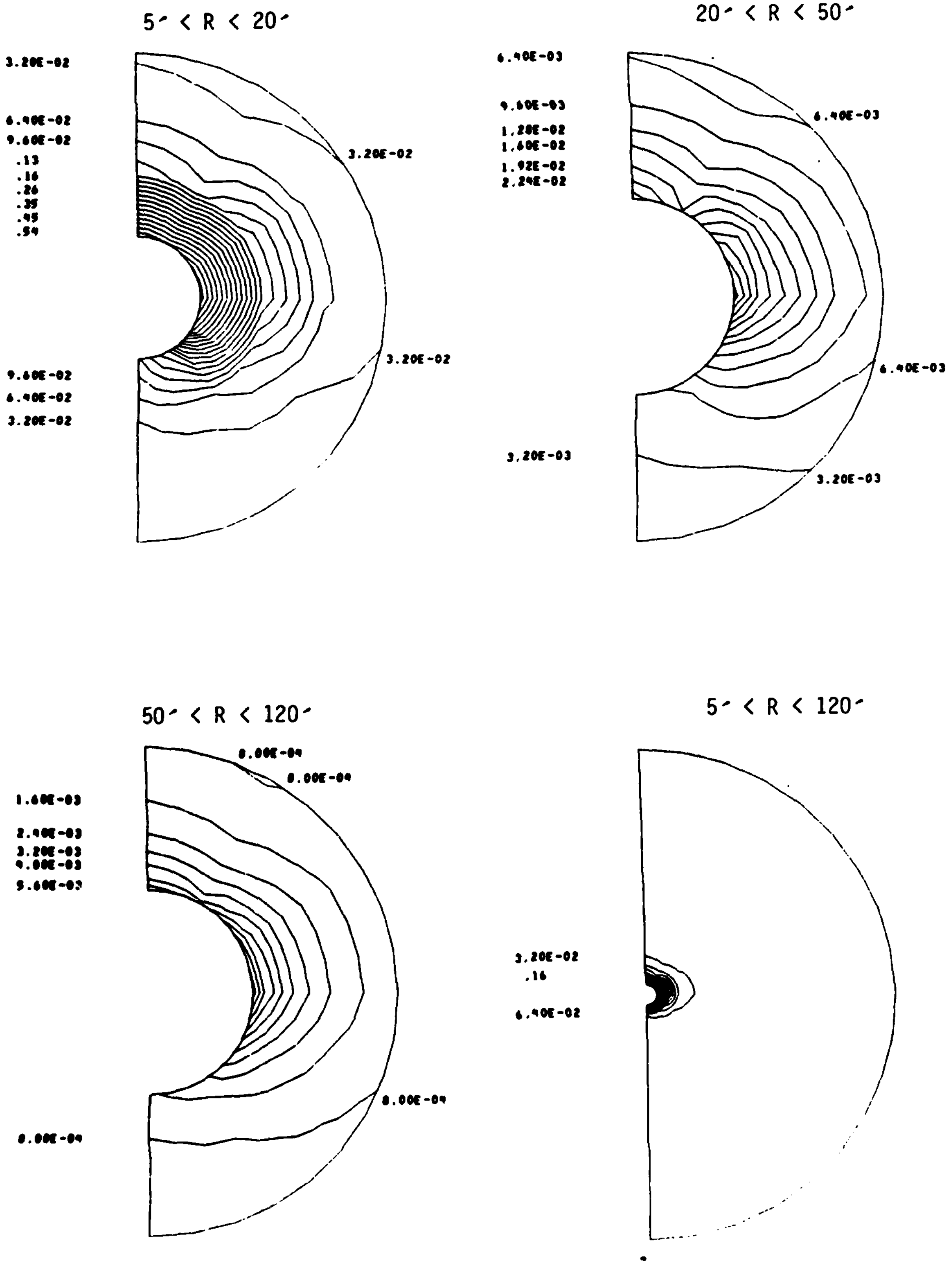


Figure 13(d)

$\theta = 15°$

Dynamic Pressure, P_{dyn}



$\theta = 15°$

A-Duration, A_{dur}

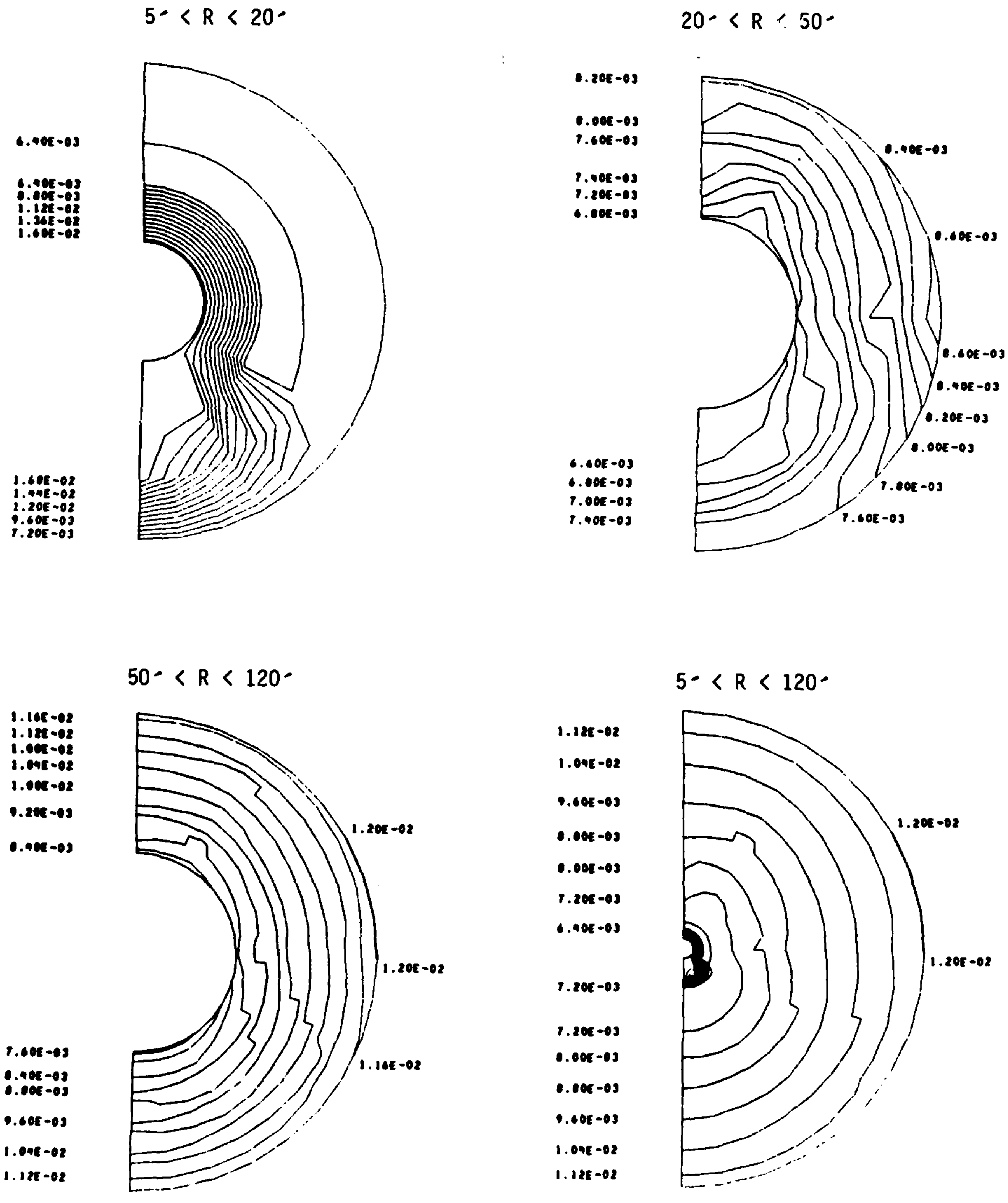


Figure 13(f)

$\theta = 15°$

A-Impulse, A_{imp}

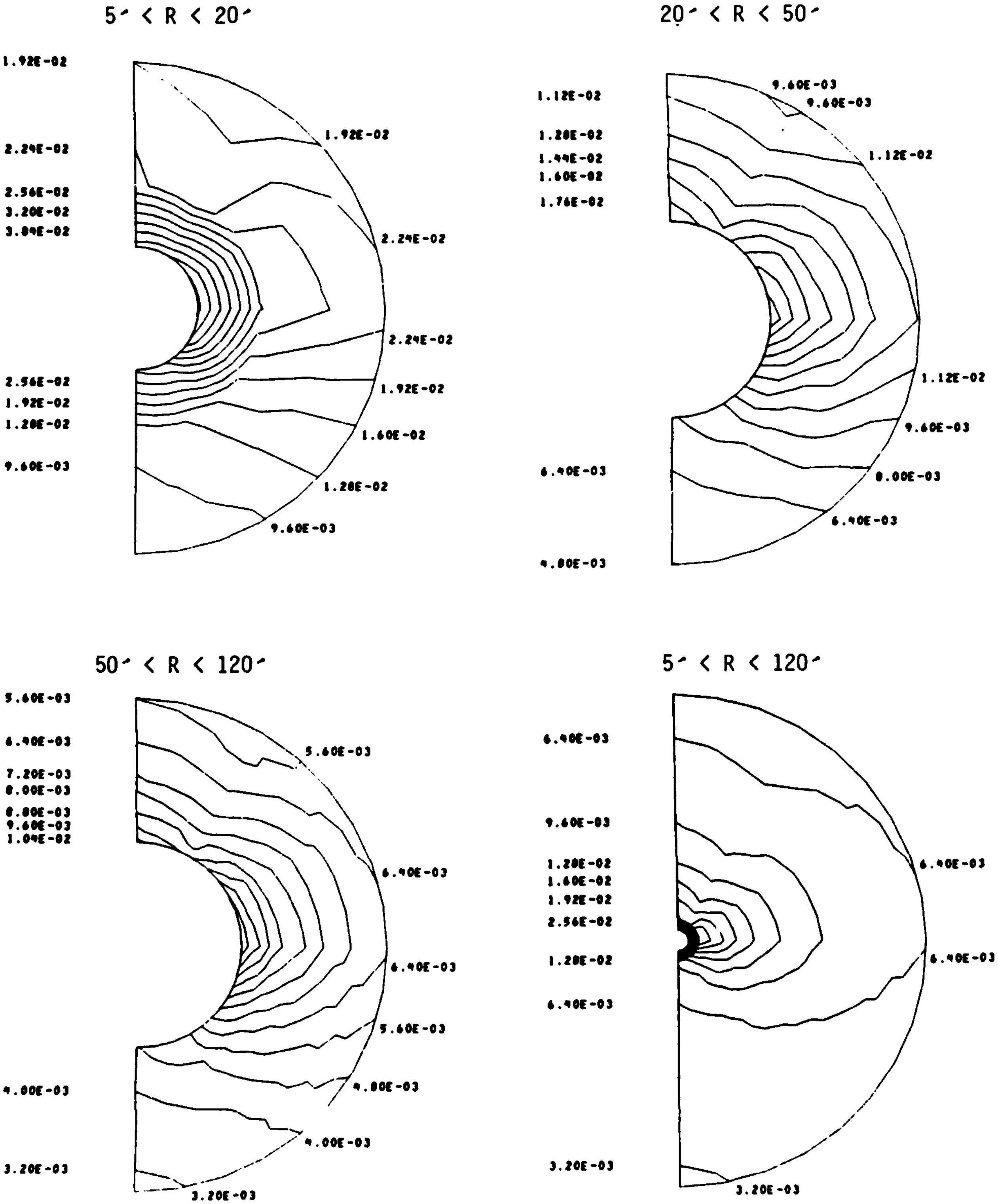


Figure 14(
θ = 45°

Incident Pressure Pulse, p_1

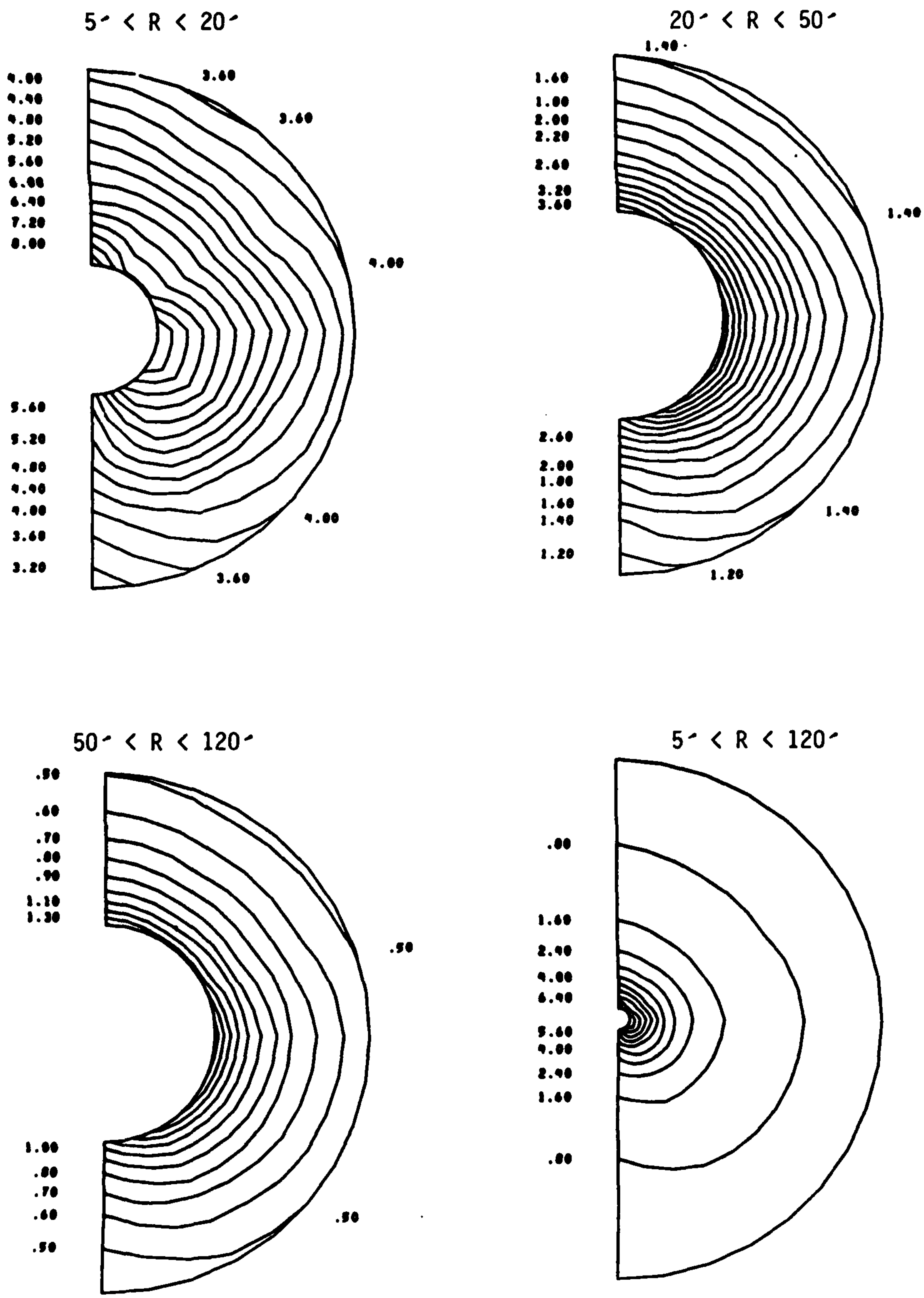


Figure 14(b)

$\theta = 45°$

Reflected Pressure Pulse, p_2

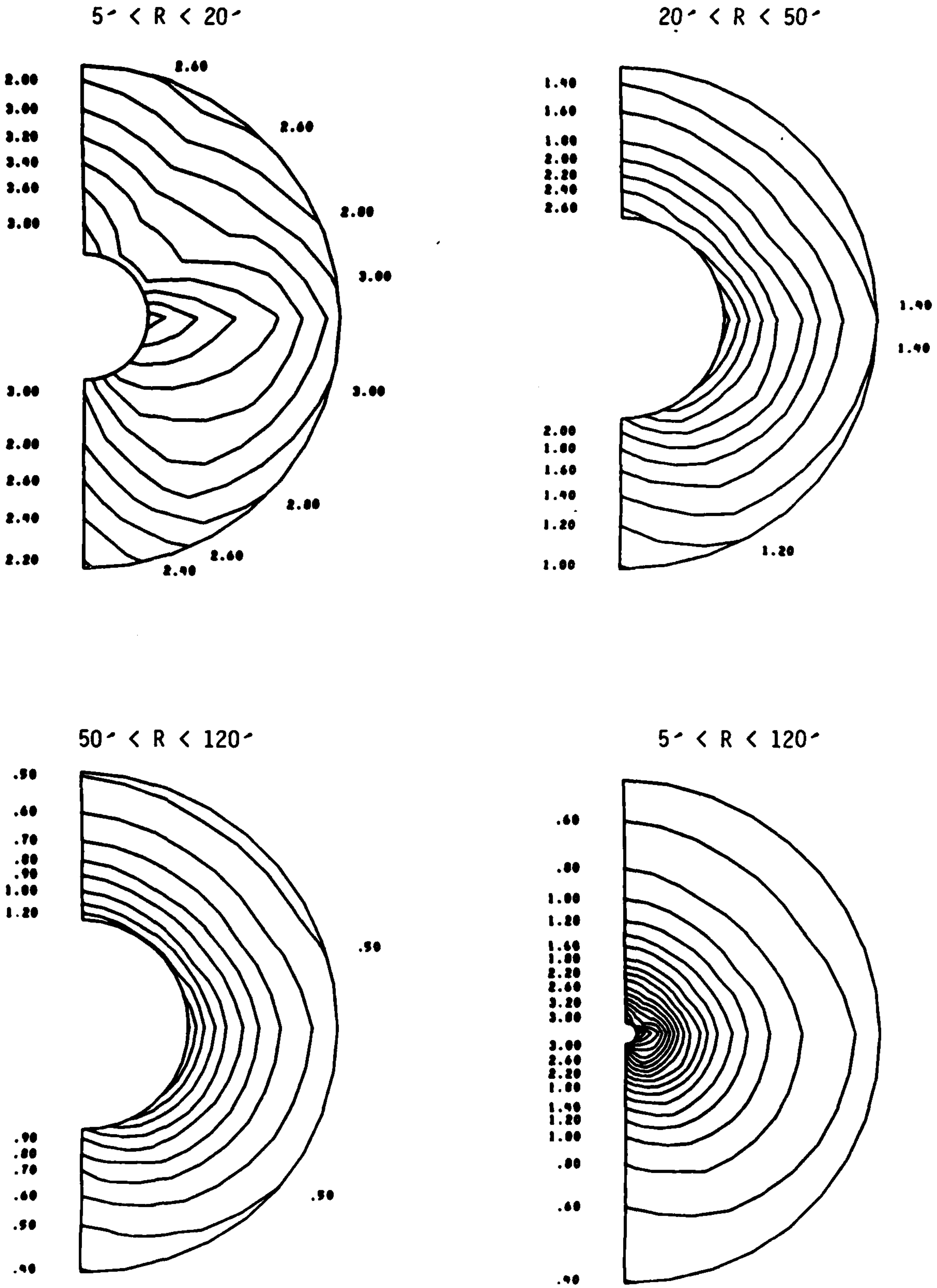


Figure 14(c)

$\theta = 45°$

Static Pressure, p_{stat}

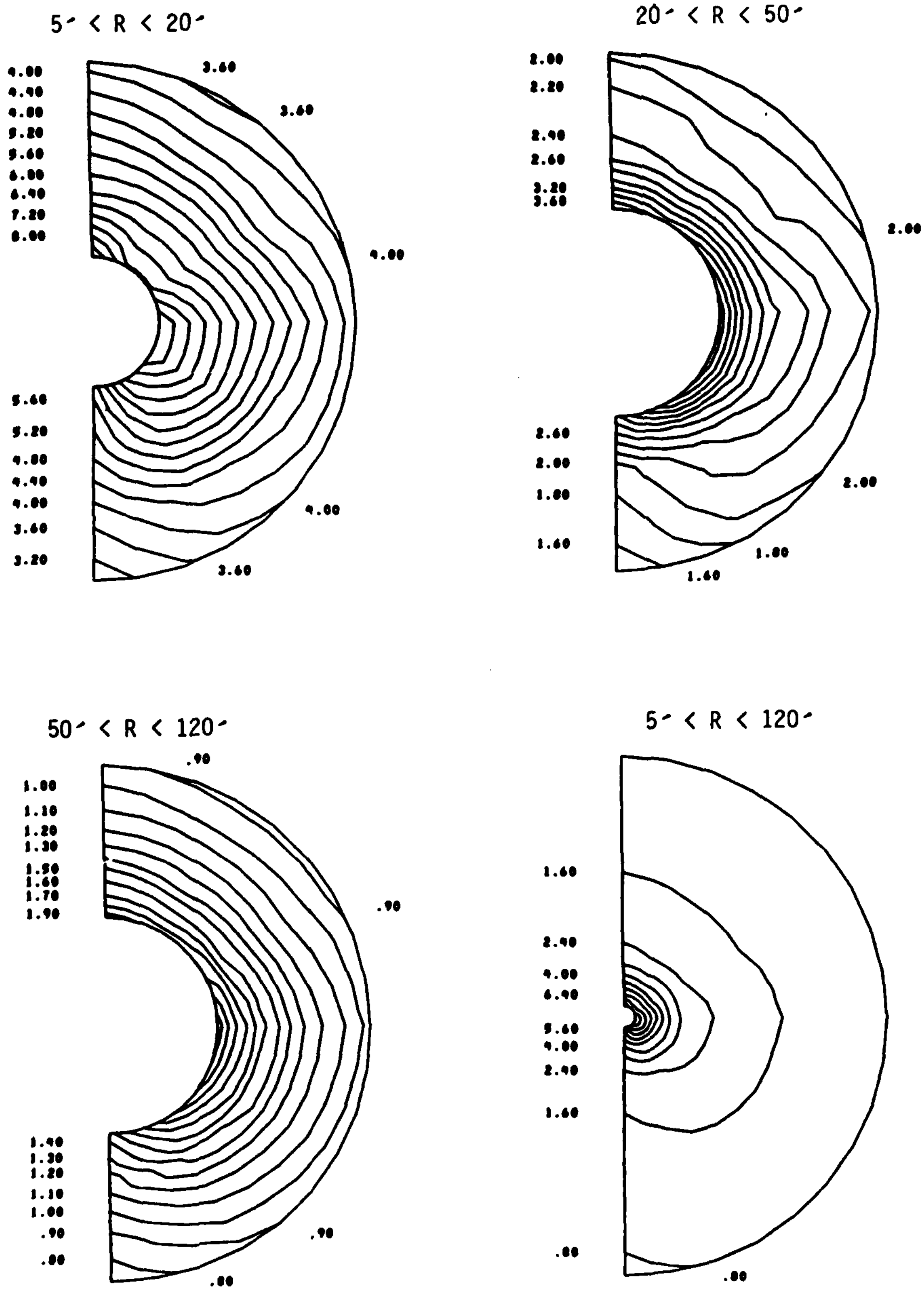


Figure 14(d)
$\theta = 45°$

Dynamic Pressure, P_{dyn}

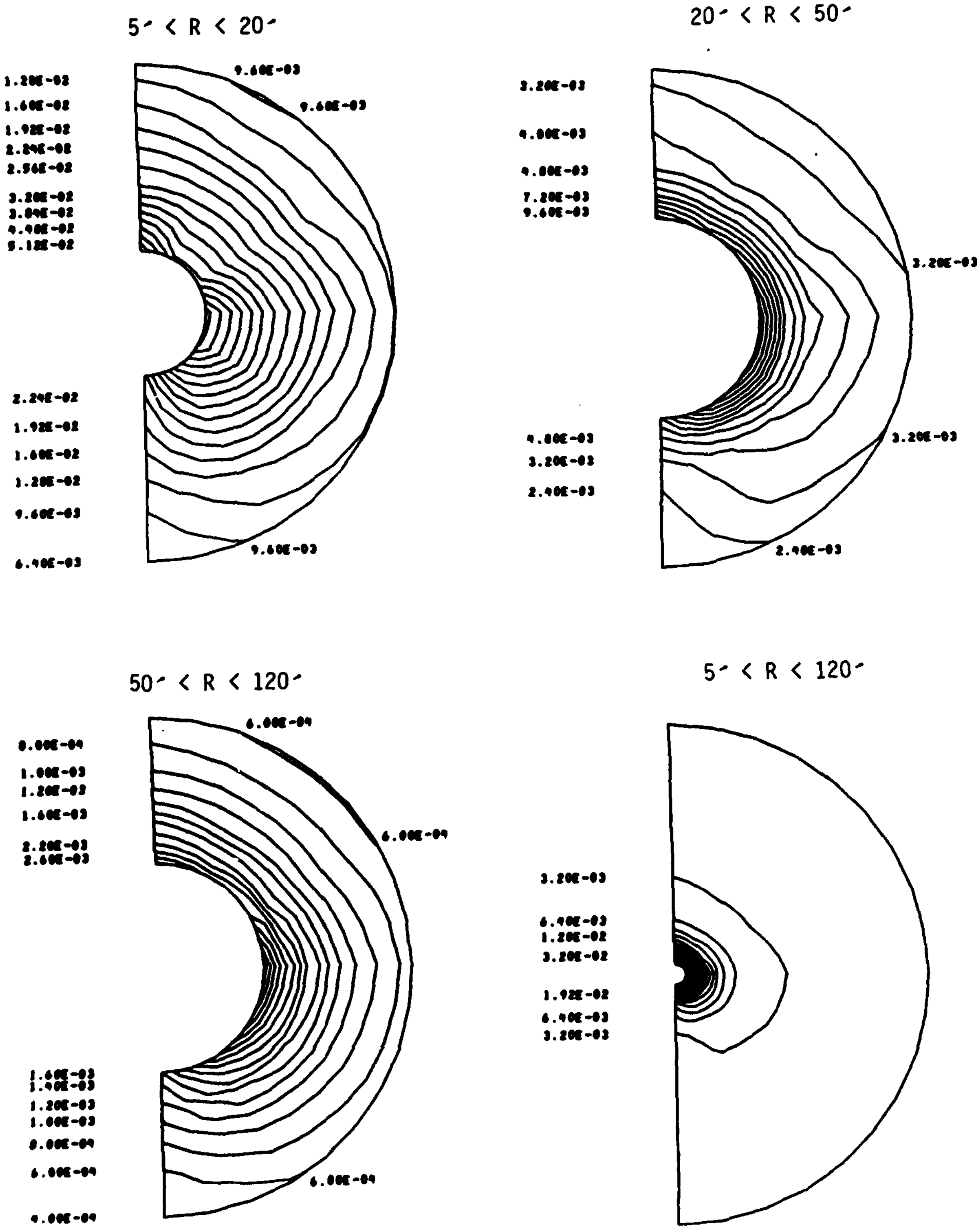


Figure 14(e)

$\theta = 45°$

A-Duration, A_{dur}

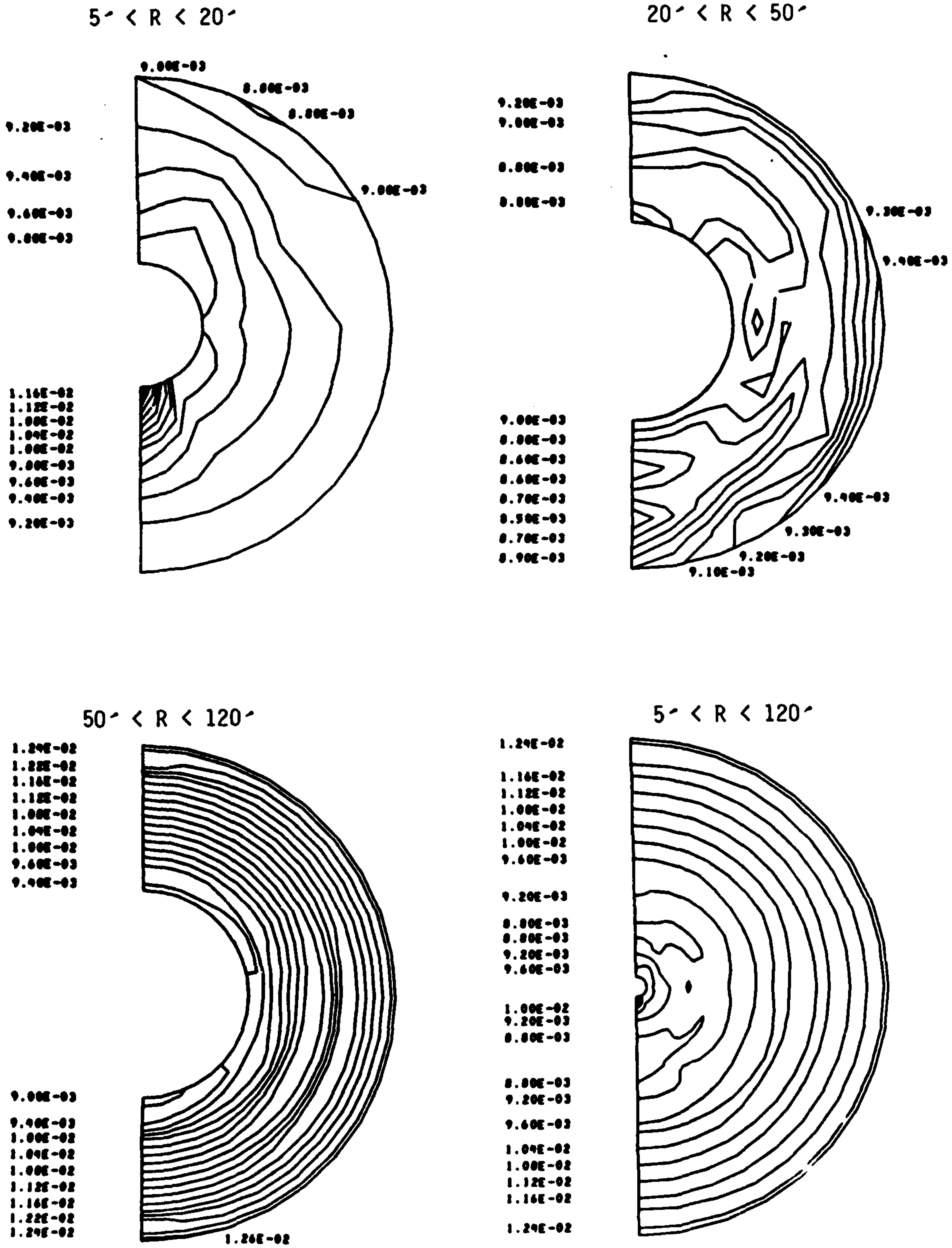
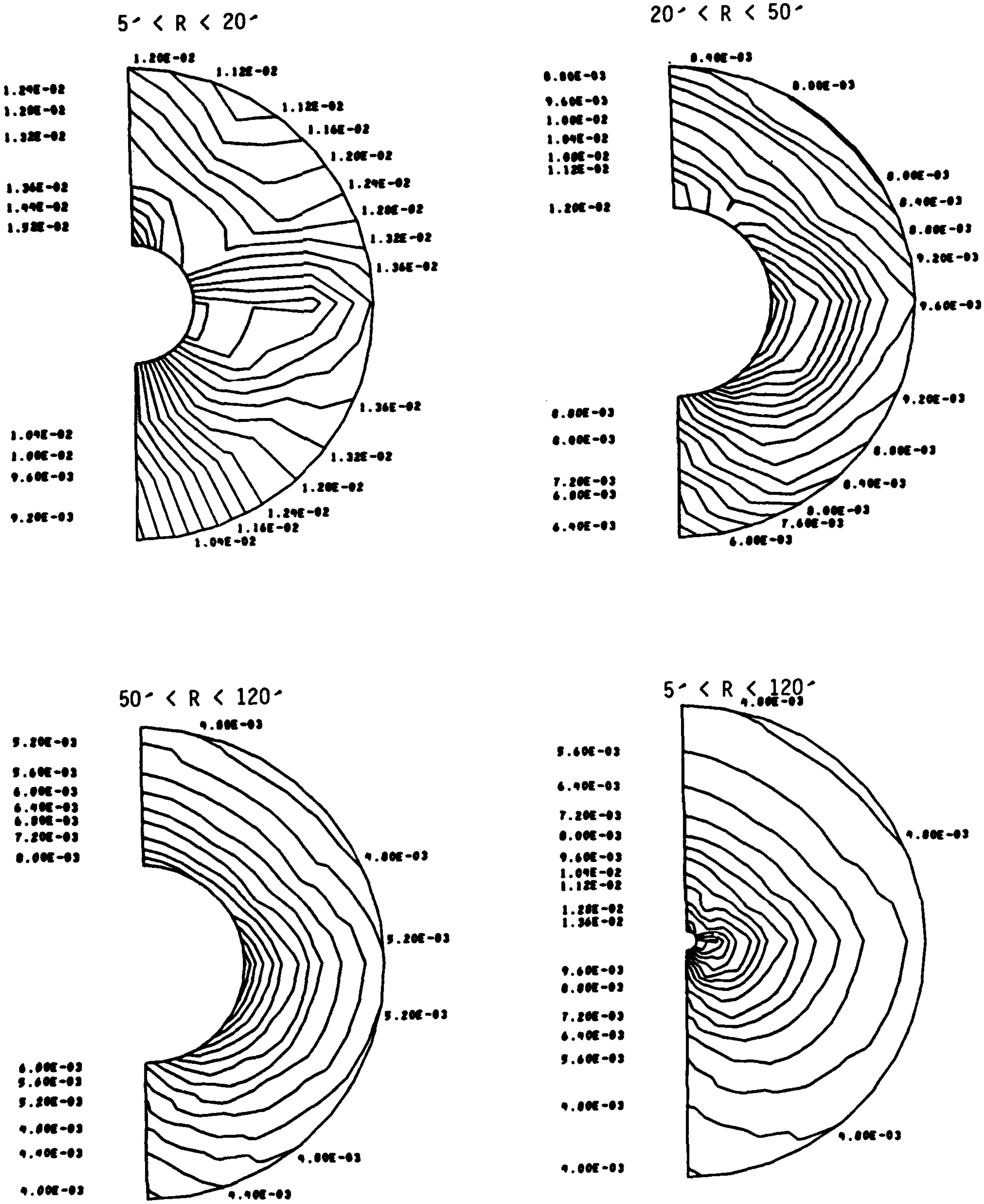


Figure 14(f)

$\theta = 45°$

A-Impulse, A_{imp}



A closer examination reveals that certain peaks in the calculated trace (e.g., the traces at 30 and 40 meters in Figures 9a-g) are too large compared with the corresponding measured values. However, one can also see in these figures that there are sometimes sharp spikes superimposing on the measured trace, especially at the shock fronts at the near locations (10 and 20 meters). The cause of these spikes is not clear at the moment, but they affect strongly the maximum pressure which we used to determine the initial condition, i.e., the initial pressure P_s in our calculation. It is preferable to build our calculation on a physical quantity which does not depend so much on these spikes of unknown cause and then to make detail quantitative comparison with the field data. Such a physical quantity is the A-impulse, since it is an integrated quantity and is insensitive to rapid fluctuations and narrow spikes. We present the results of such a calculation in the next subsection (Section 2.2.2).

2.2.2 Comparison by Matching A-Impulse

For a fixed elevation we choose for each radial line (at azimuthal directions $\psi = 0°, 30°, 60°, 90°, 120°$ and $150°$) an initial pressure P_s so that the calculated A-impulse at a large distance (e.g., at r = 30 meters) matches with the measured value. With this set of P_s values extensive calculation on all the physical quantities of interest are performed. The validity of the BLAST code is then judged from the overall fit of the whole set of calculation results with the data.

The P_s values determined in this way are presented in Figure 15. The initial pressurized balloon radius r_o used is again 3 feet. The choice of r_o influences the initial pressure P_s. However, our calculation showed that the results of the calculation, i.e., the pressure trace, A-impulse and A-duration, etc., essentially do not depend on this choice of initial condition.

Figure 15 also shows the variation of P_s at the three elevation angles: the shapes of the curves for the three elevation angles are very similar, with a slight variation of the peak positions. This is quite different from the three P_s curves in Figure 8 where the maximum pressure is used to calibrate the initial condition of the calculation. The irregular variation of P_s in

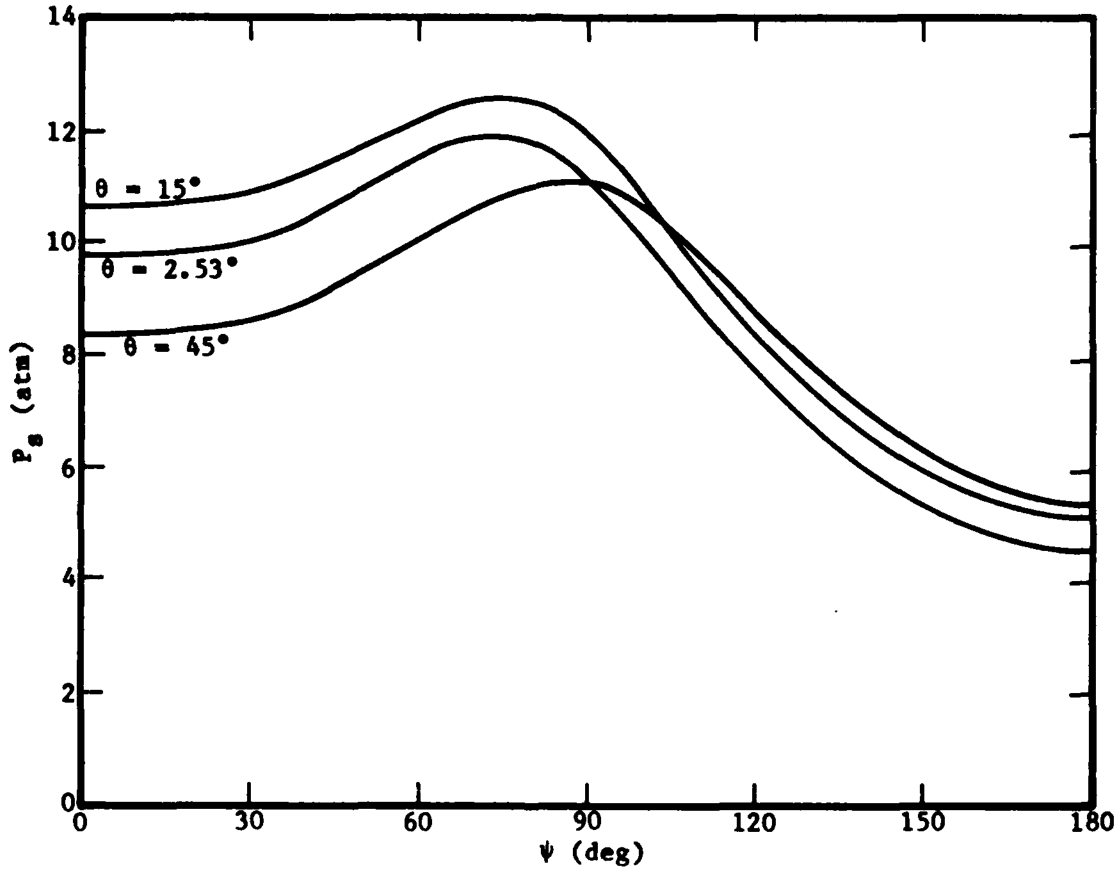


Figure 15. Source Pressures as Calibrated with A-Impulse for the May 1979 Firings.

Figure 8 reflects the effect of the sharp spikes which appear in the pressure trace in an unpredictable fashion. The variation of P_s in the present calculation (Figure 15), on the other hand, reflects the change of the flow field near the muzzle brake when the orientation of the muzzle brake is varied.

In Figures 16-18 results of the calculated A-impulse (solid curve), A-duration (dashed curve), and maximum static overpressure (dot-dash curve) are shown as functions of radial distance. The corresponding measured values are represented there by circles, triangles and squares, respectively. In Figure 19 calculated pressure-time histories are presented for a few selected cases.

From Figures 16-19, one sees that the overall performance of the BLAST code is good. The calculated A-impulse, A-duration and maximum static overpressure follow the experimental values closely for all azimuthal orientations and elevation angles.

In comparing the calculation with the field data, one should of course keep in mind that the data contains a substantial amount of uncertainty, as indicated by the large spreading of the three sets of data points in Figures 16-18. The uncertainty in the data seems most significant in the A-duration. This is probably due to the sharp spikes which might occur on the descending slope of the pressure trace. We therefore feel that the comparison for the A-duration is meaningful only in order of magnitude and in this respect the agreement of the calculated and experimental values is excellent.

Figures 16-18 show that the calculated maximum static overpressures are considerably lower than the corresponding measured values, especially at smaller distances ($r = 10$ and 20 meters). On the other hand, examinations of the measured traces in Figures 9-11 show that a substantial part of the measured peak value at these distances is contributed by the sharp spike. If one discounts the spikes and compares the main body of the peaks, excellent agreement between the calculated and measured maximum static overpressure is in sight. Comparisons of the calculated pressure trace in Figures 19a, b and c with the measured trace in Figures 9c, 10c and 11c will confirm the agreement.

Since the calculation was performed so that the calculated and measured A-impulses are matched at $r = 30$ meters, comparison of this quantity should be

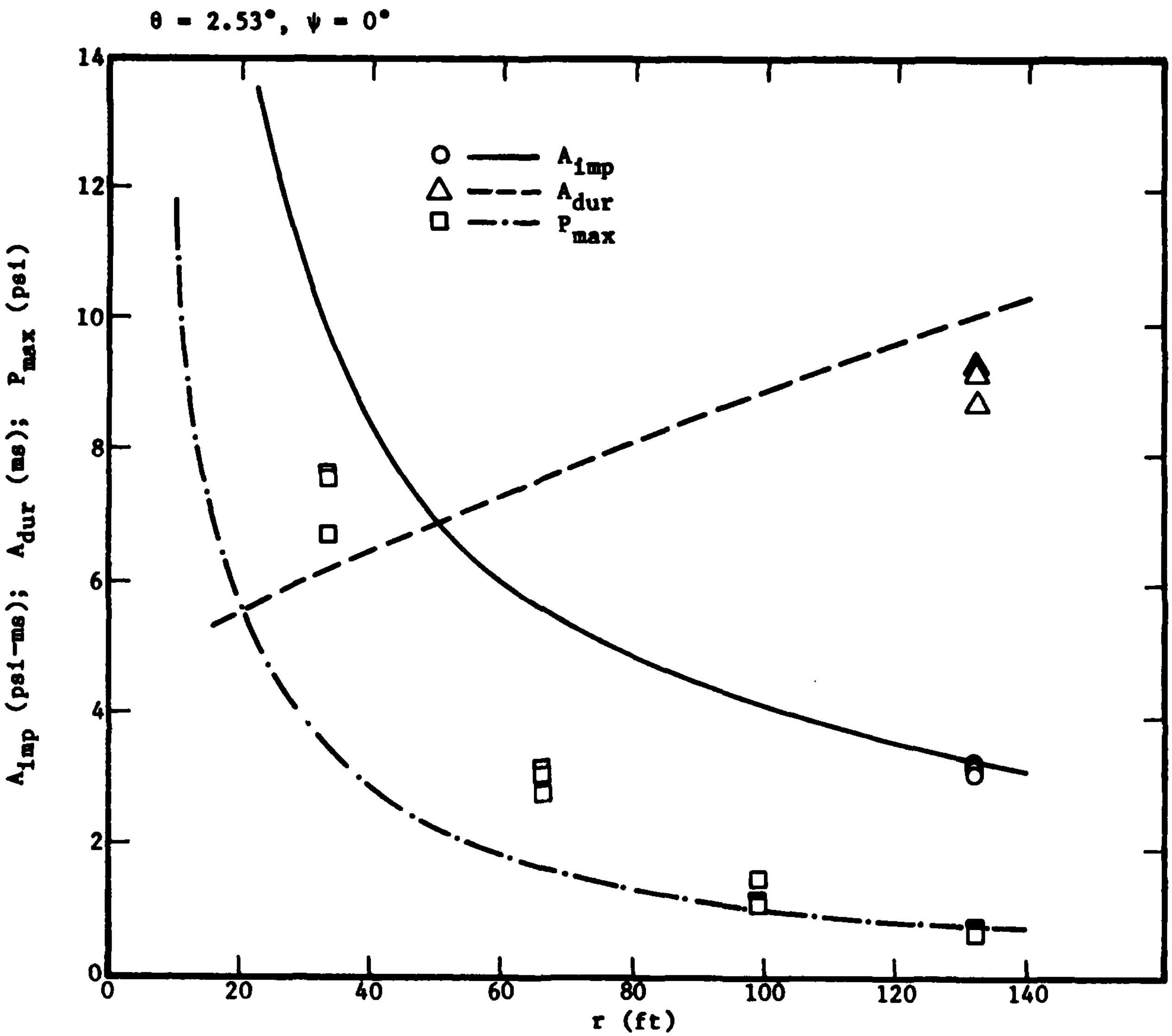
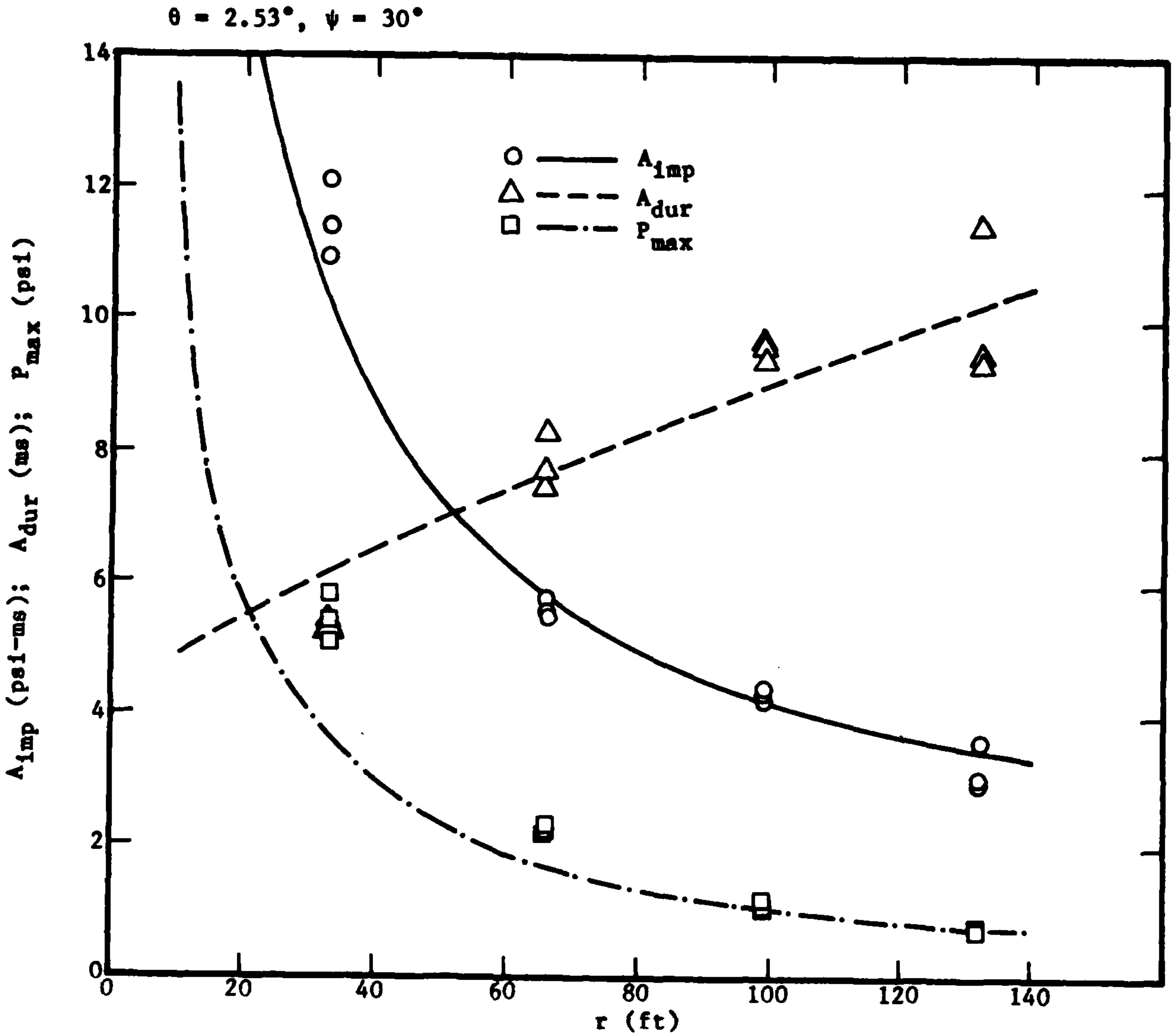
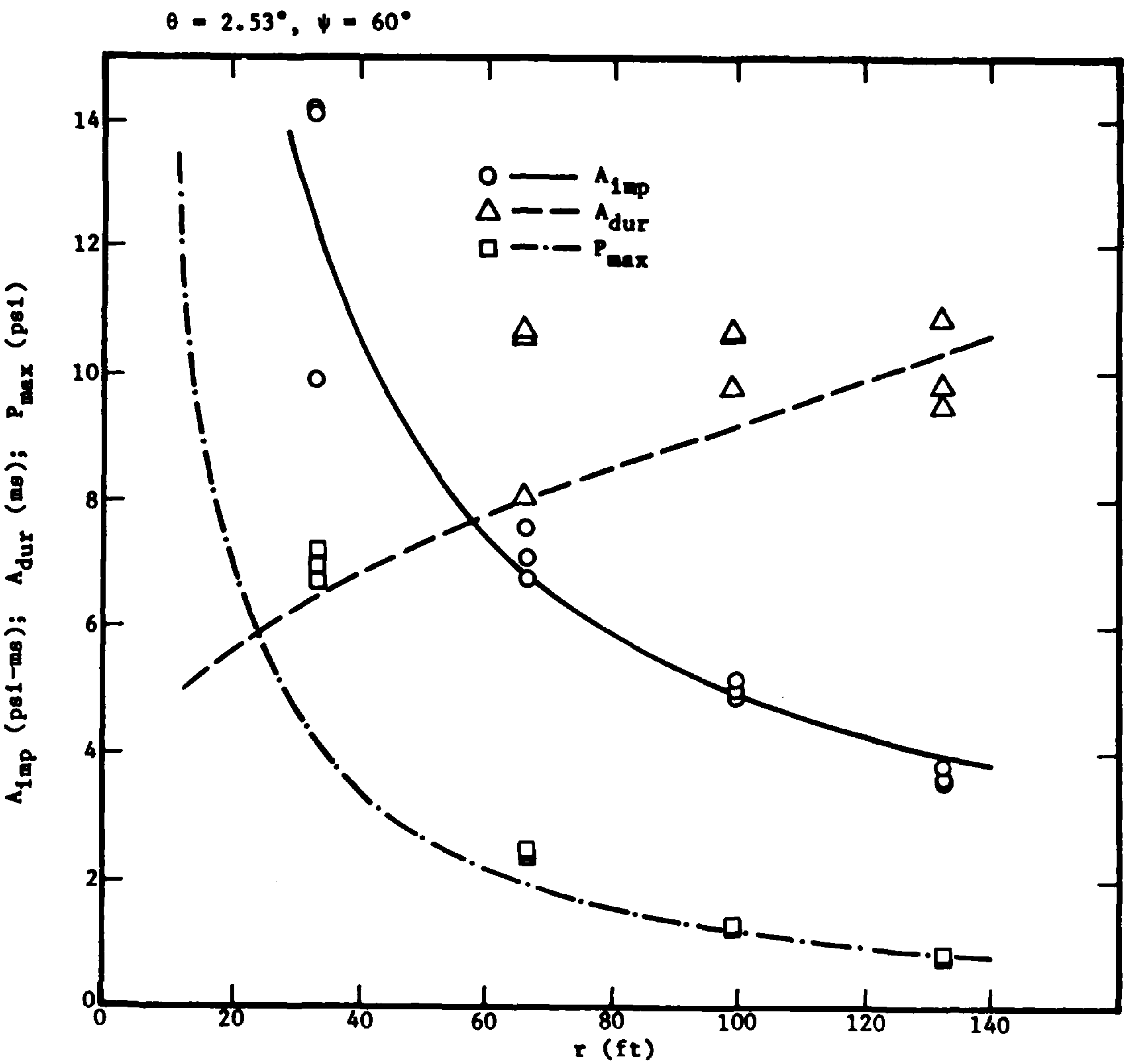

θ = 2.53°, ψ = 0°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
20
40
60
80
100
120
140
2
4
6
8
10
12
14

Figure 16(a)



θ = 2.53°, ψ = 30°
A_imp
A_dur
P_max
A_imp (psi-ms); A_dur (ms); P_max (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 16(b)



θ = 2.53°, ψ = 60°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
14
12
10
8
6
4
2
0
0
20
40
60
80
100
120
140
r (ft)

Figure 16(c)

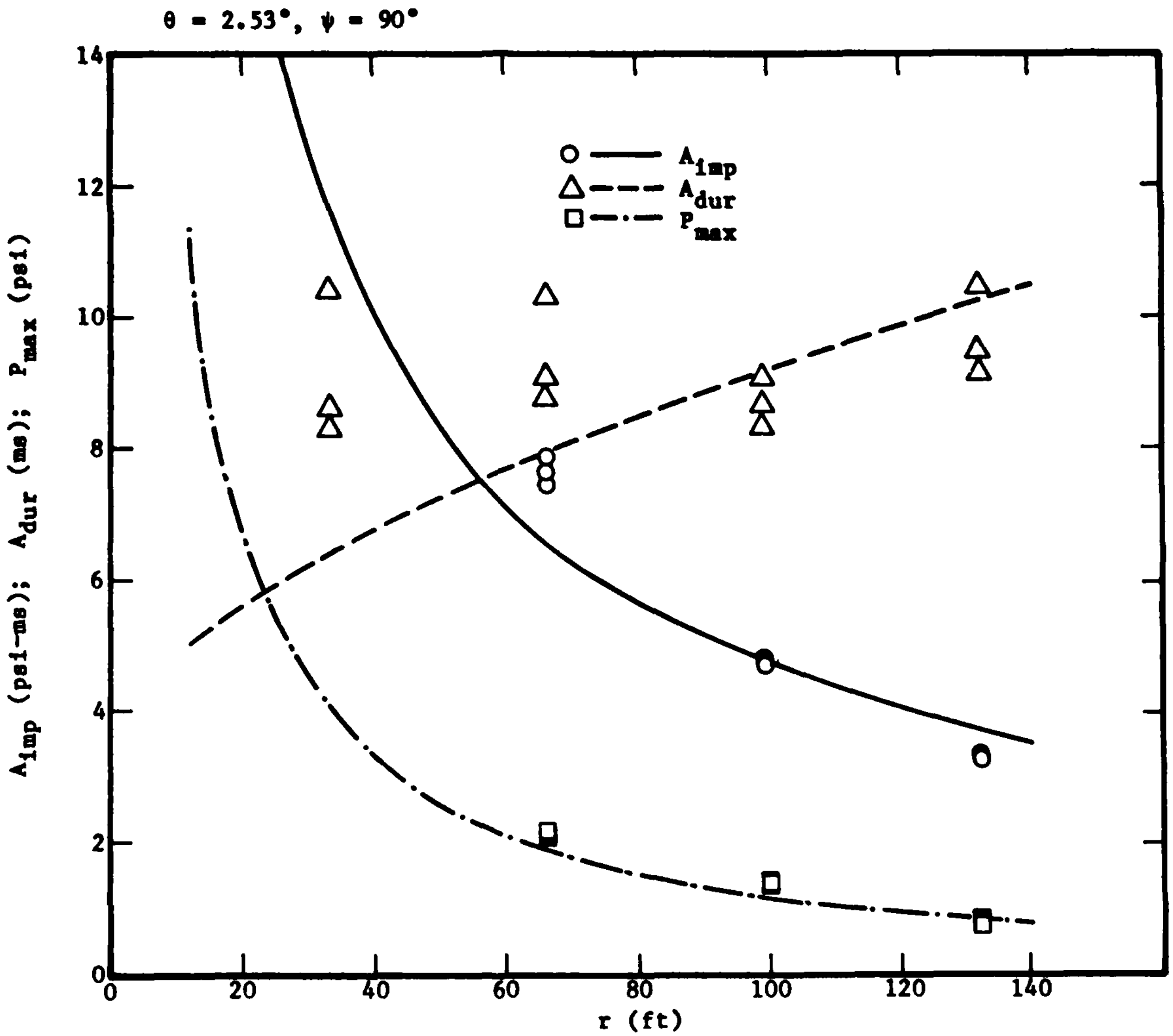
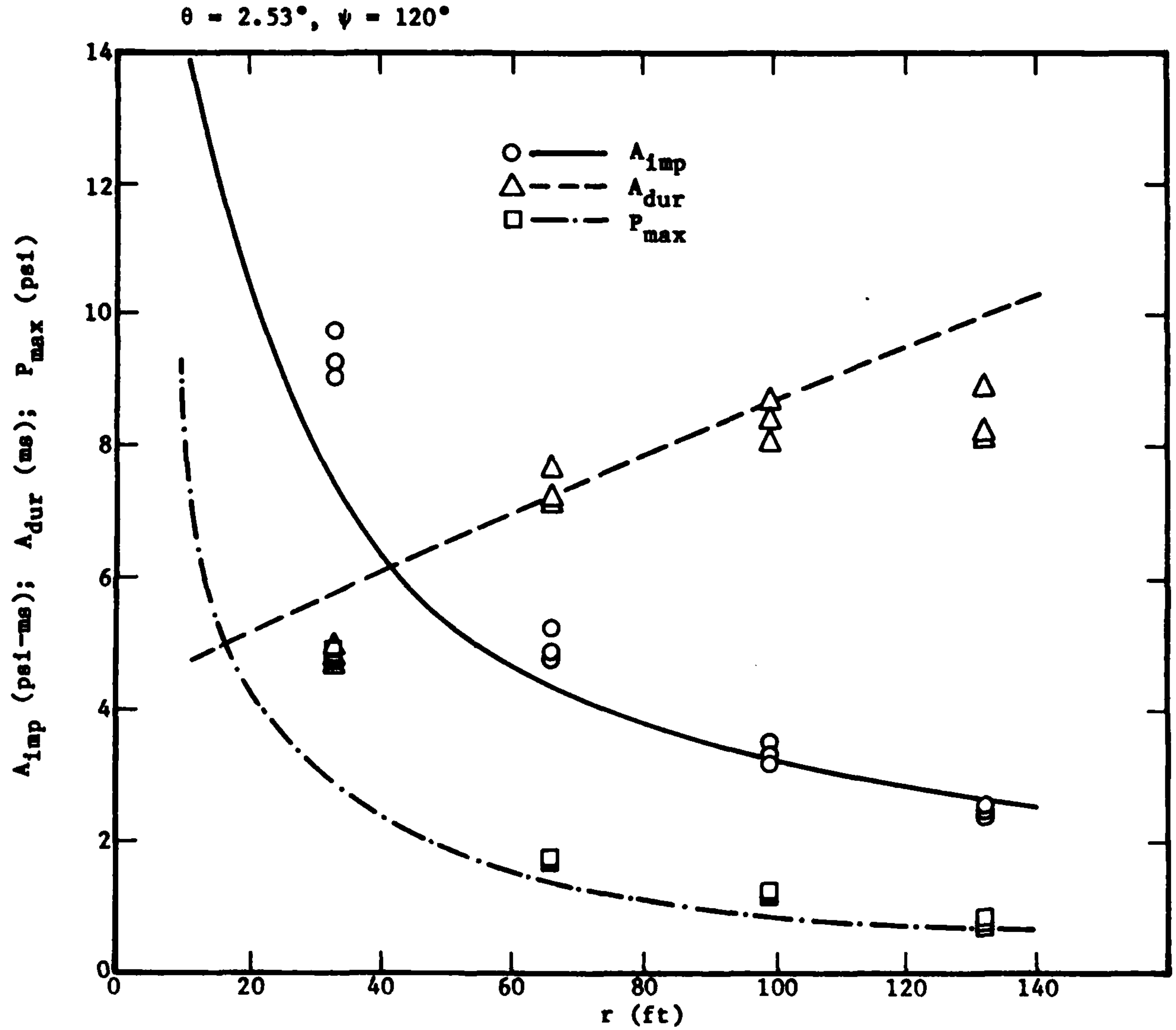

θ = 2.53°, ψ = 90°
A_imp
A_dur
P_max
A_imp (psi-ms); A_dur (ms); P_max (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 16(d)



θ = 2.53°, ψ = 120°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 16(e)

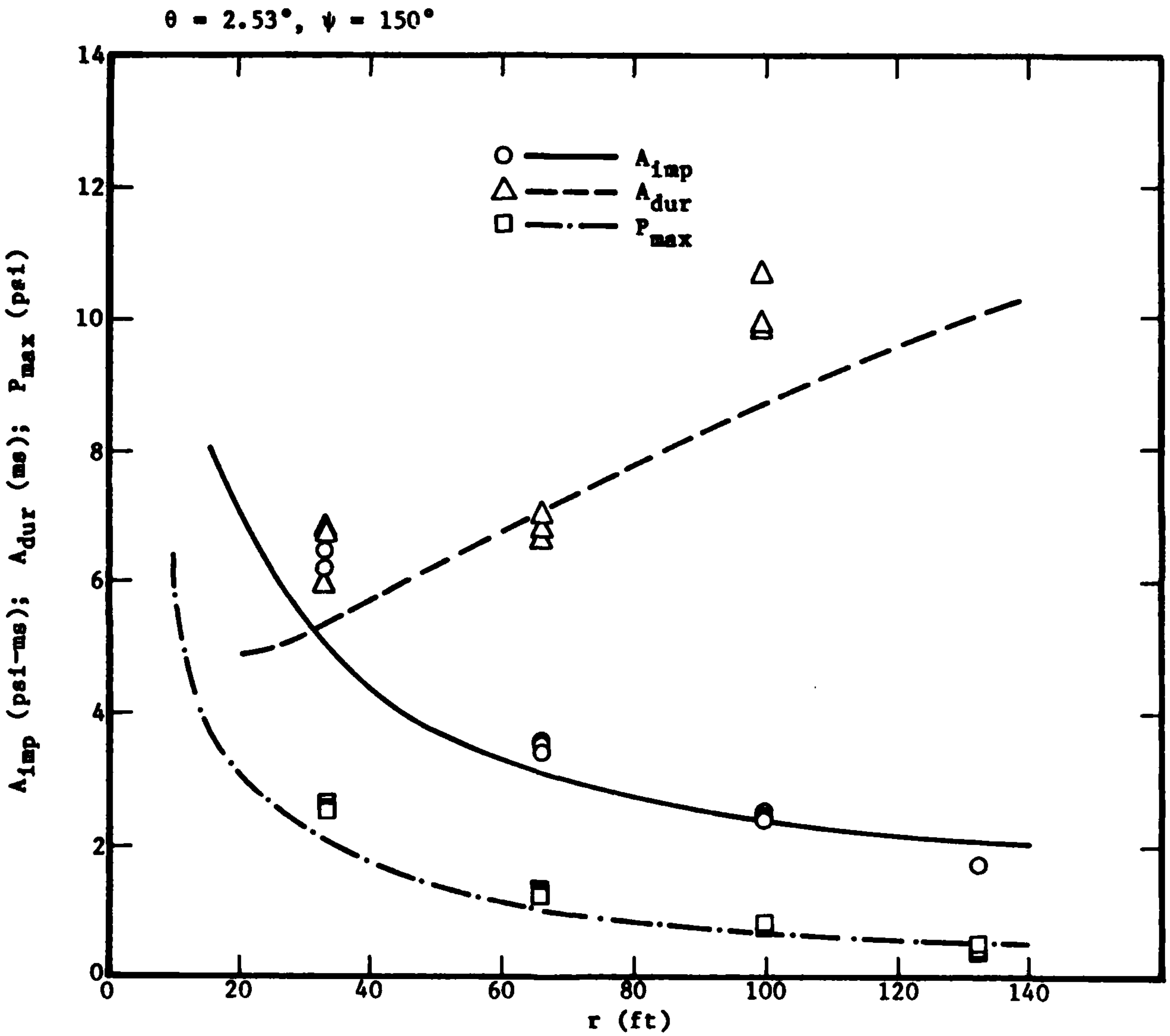

θ = 2.53°, ψ = 150°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140

Figure 16(f)

$\theta = 15°,\ \psi = 0°$

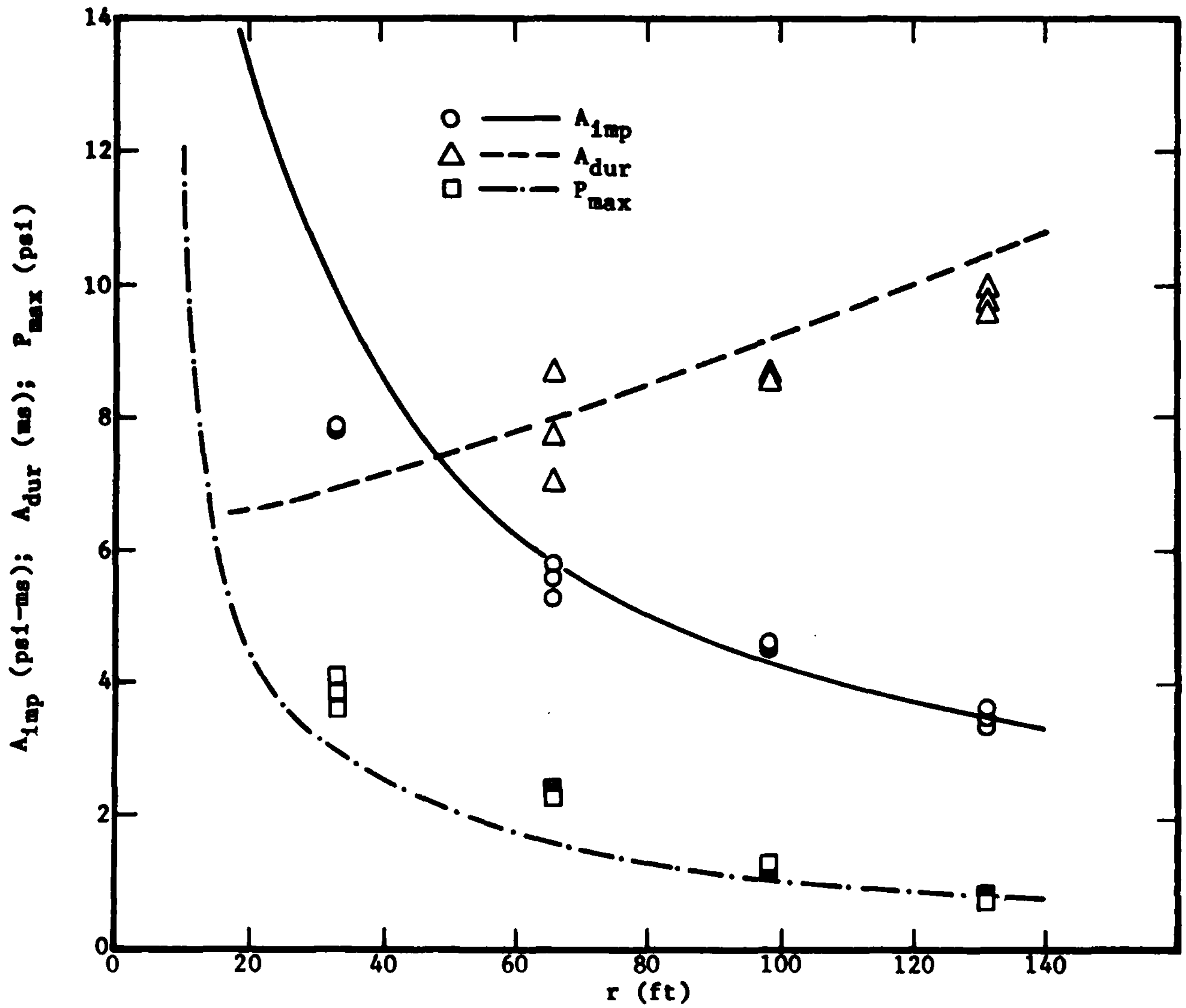


Figure 17(a)

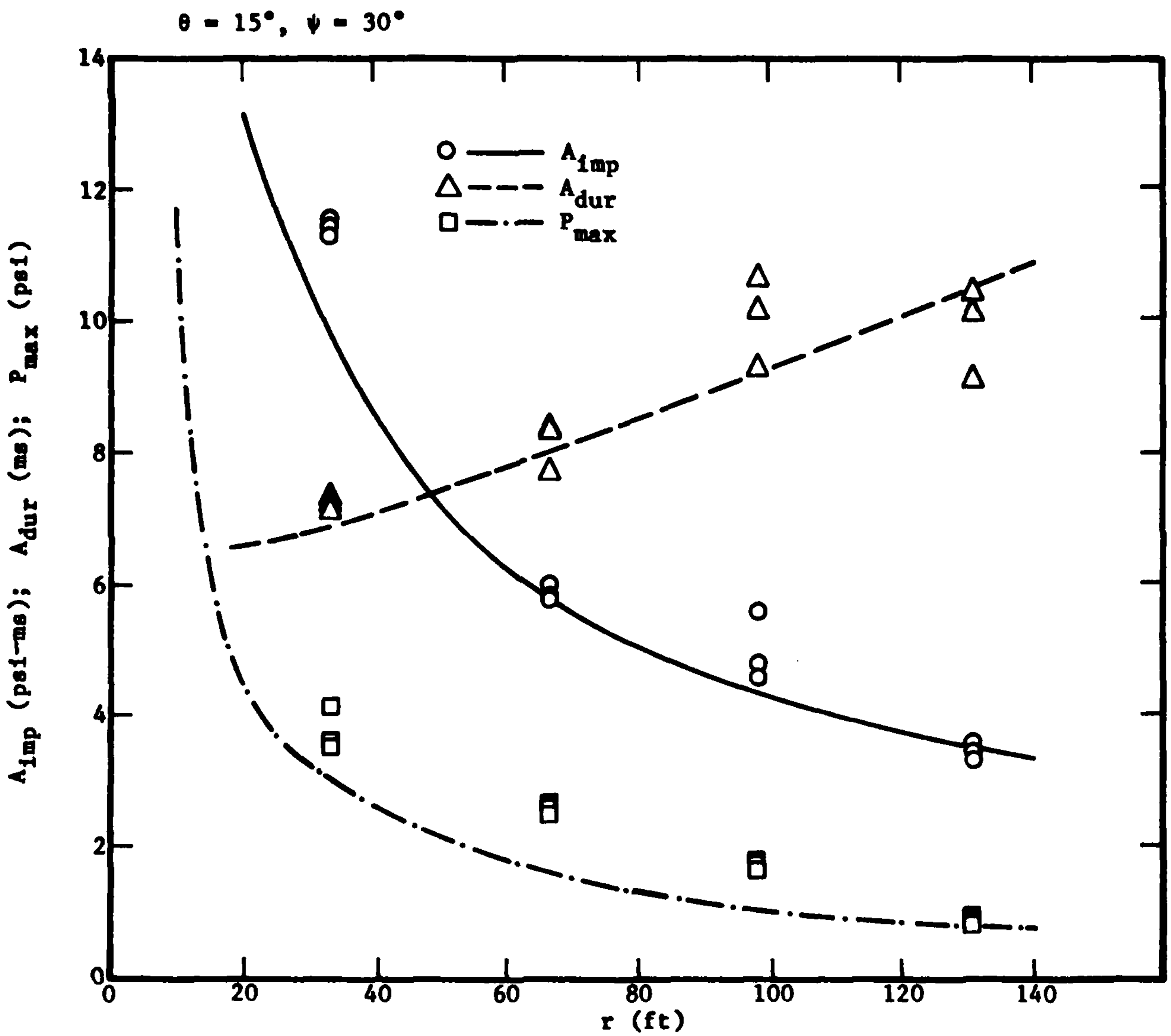
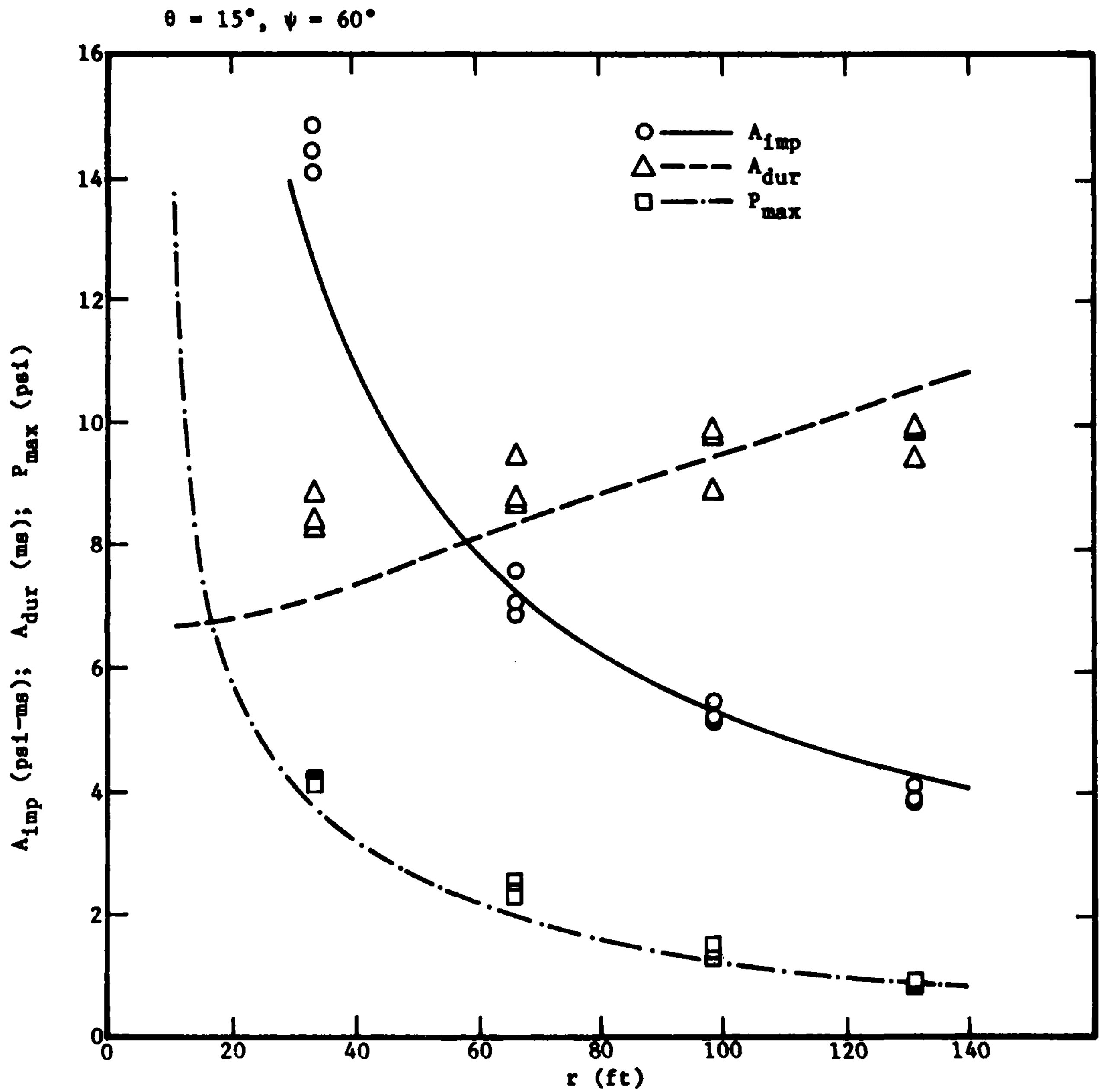
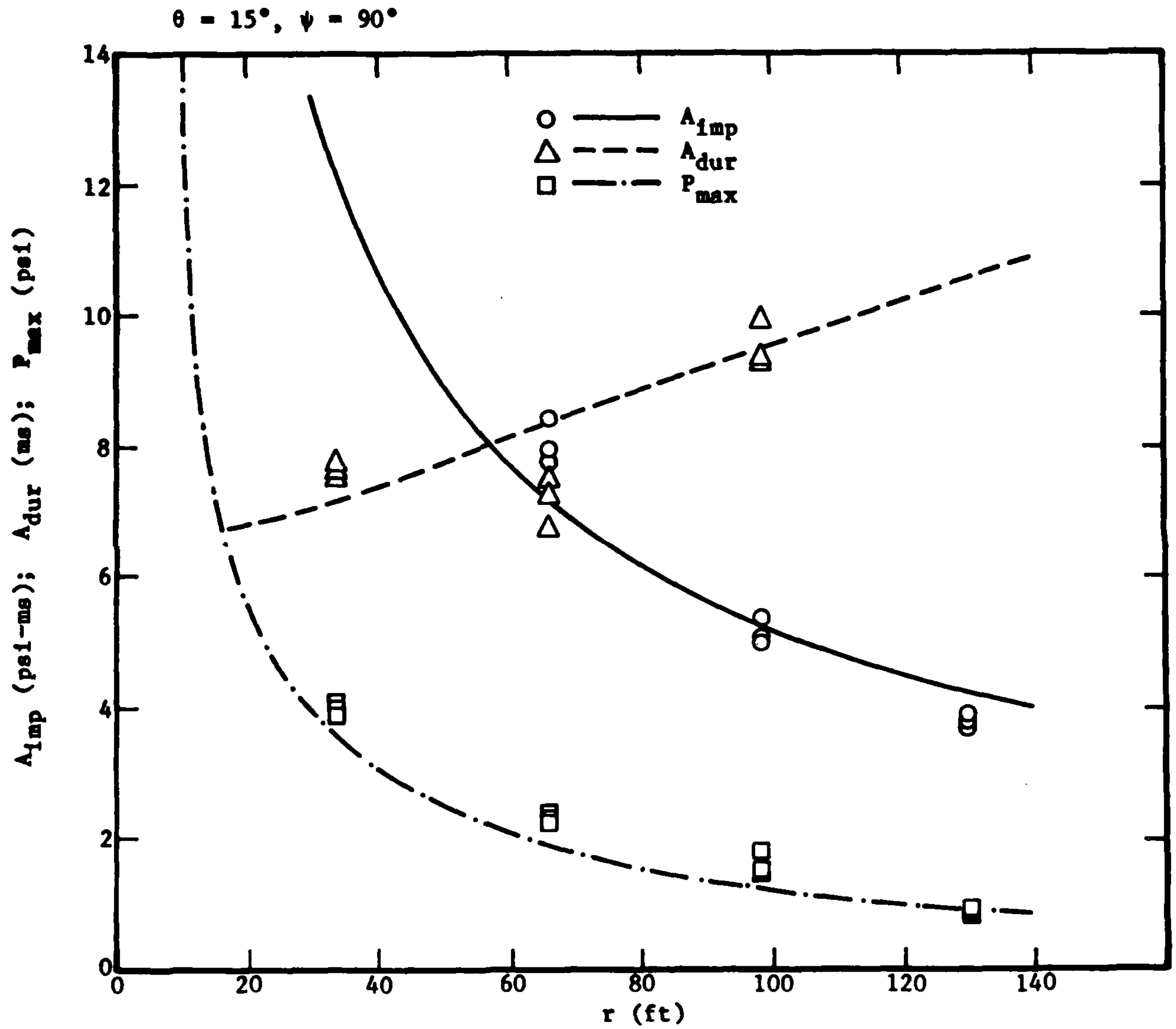

θ = 15°, ψ = 30°
A_imp
A_dur
P_max
A_imp (psi-ms); A_dur (ms); P_max (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 17(b)



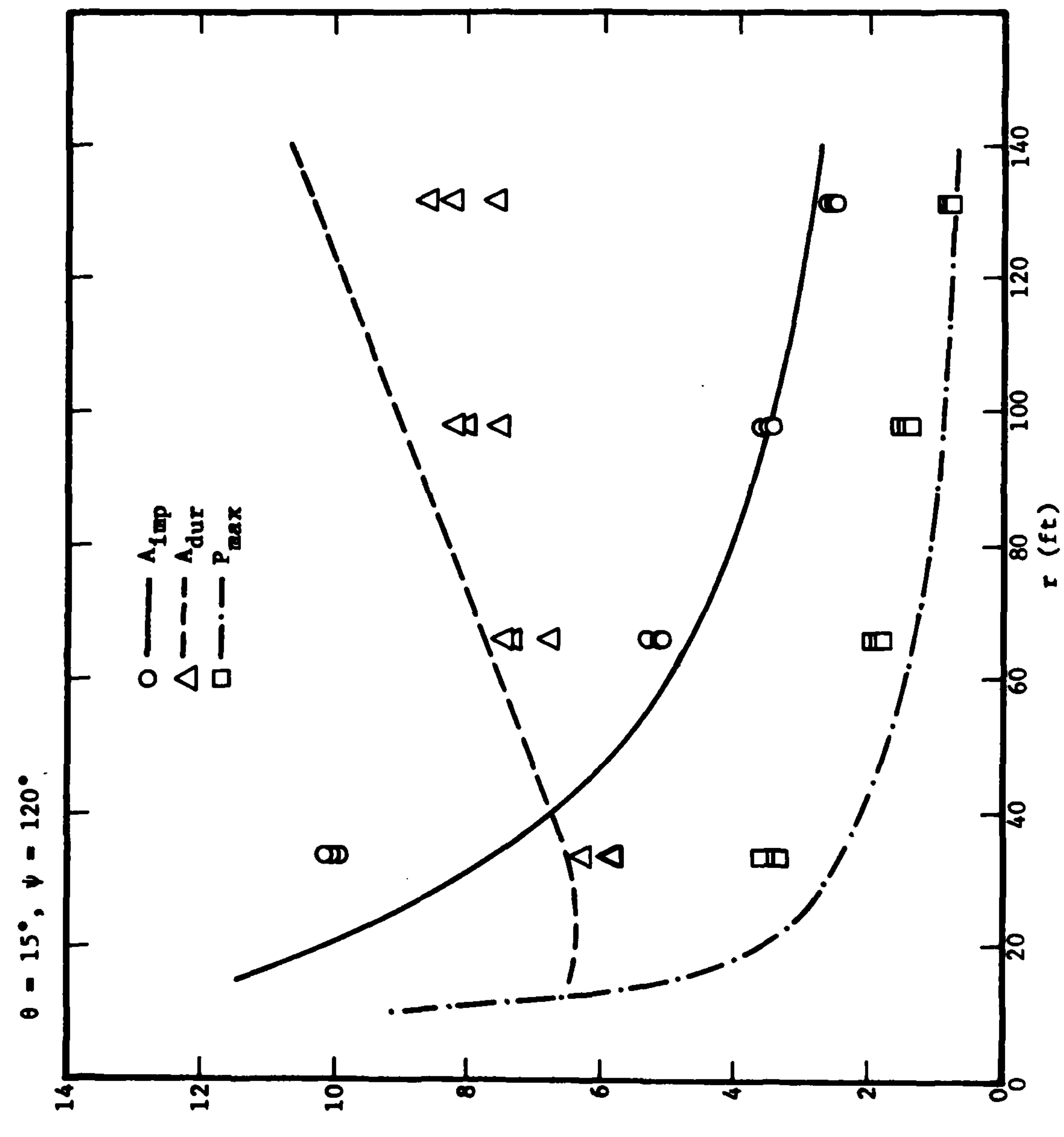
θ = 15°, ψ = 60°
16
14
12
10
8
6
4
2
0
20
40
60
80
100
120
140
r (ft)
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
A_{imp}
A_{dur}
P_{max}

Figure 17(c)



θ = 15°, ψ = 90°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
20
40
60
80
100
120
140
0
2
4
6
8
10
12
14

Figure 17(d)



θ = 15°, ψ = 120°
A_imp
A_dur
P_max
A_imp (psi-ms); A_dur (ms); P_max (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 17(e)

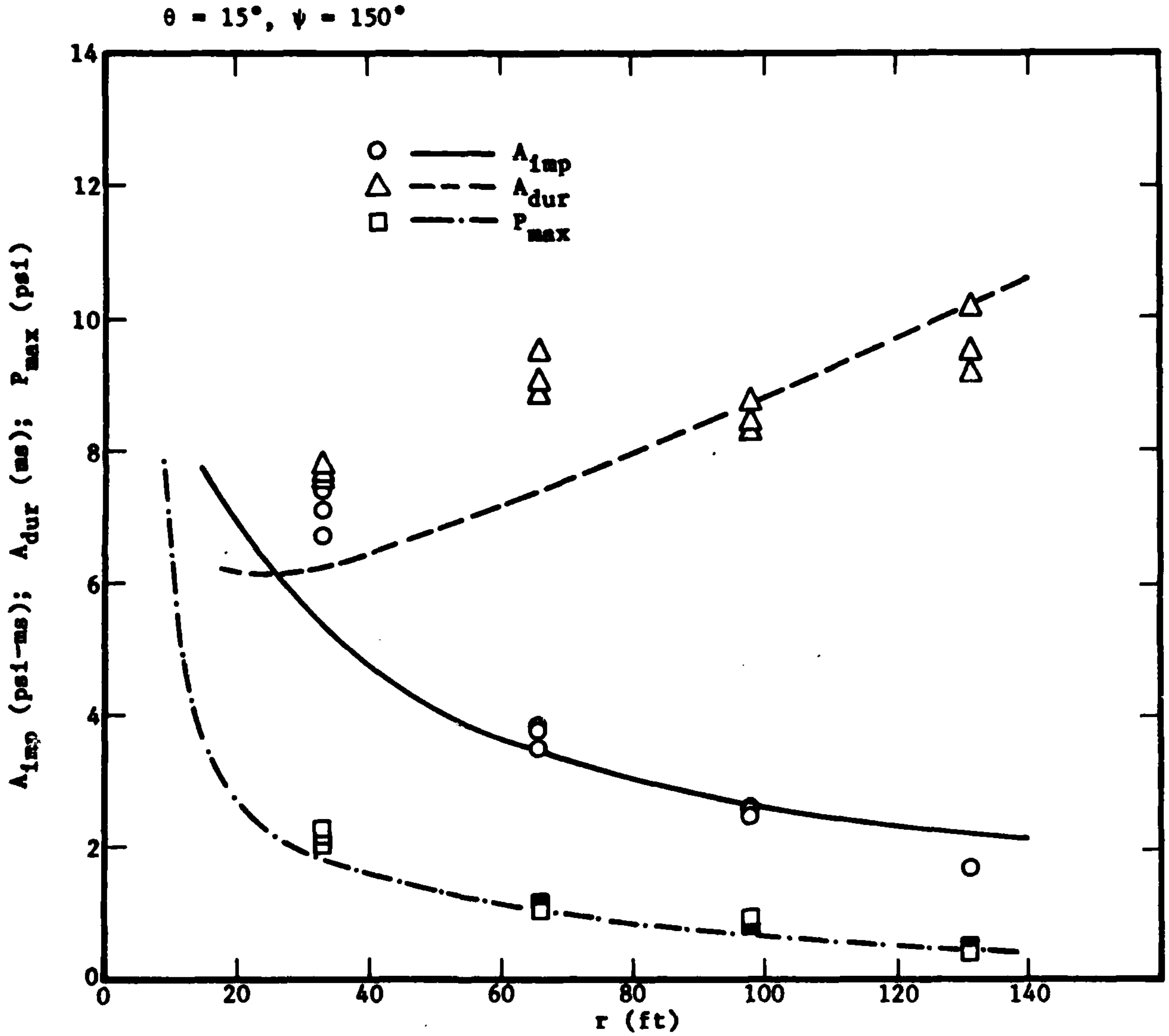

θ = 15°, ψ = 150°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
r (ft)

Figure 17(f)

θ = 45°, ψ = 0°

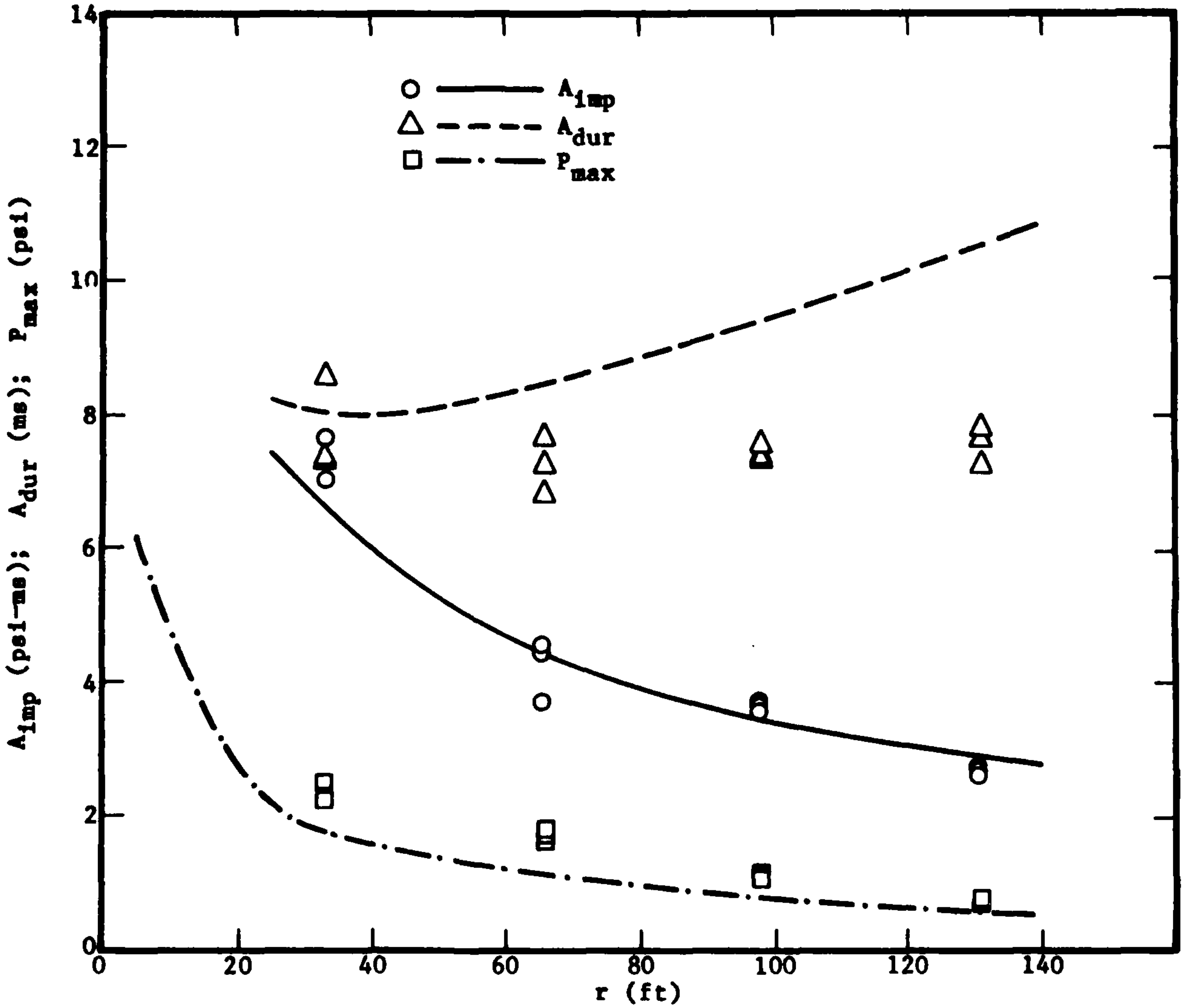
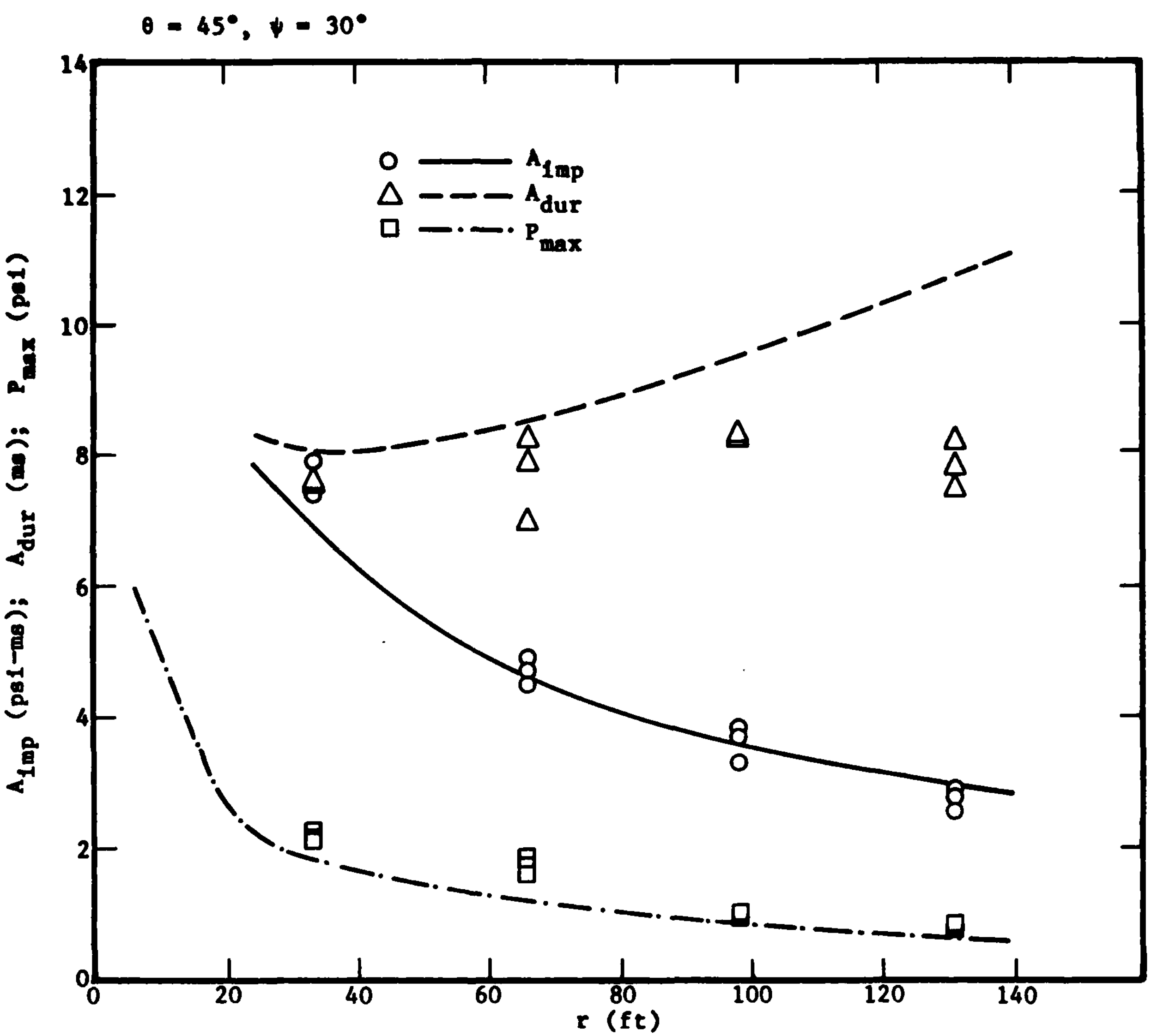


Figure 18(a)



θ = 45°, ψ = 30°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
20
40
60
80
100
120
140
2
4
6
8
10
12
14

Figure 18(b)

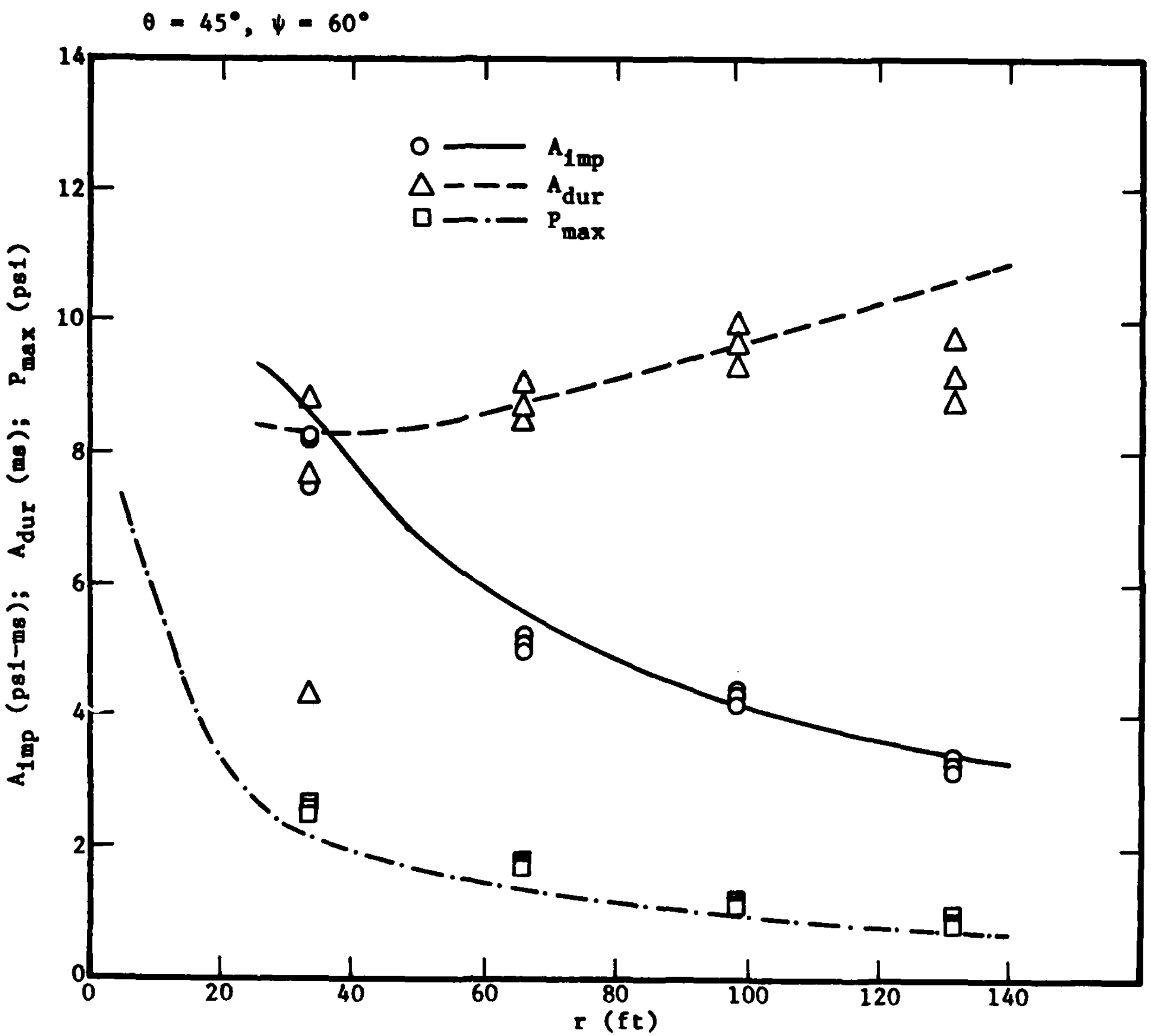
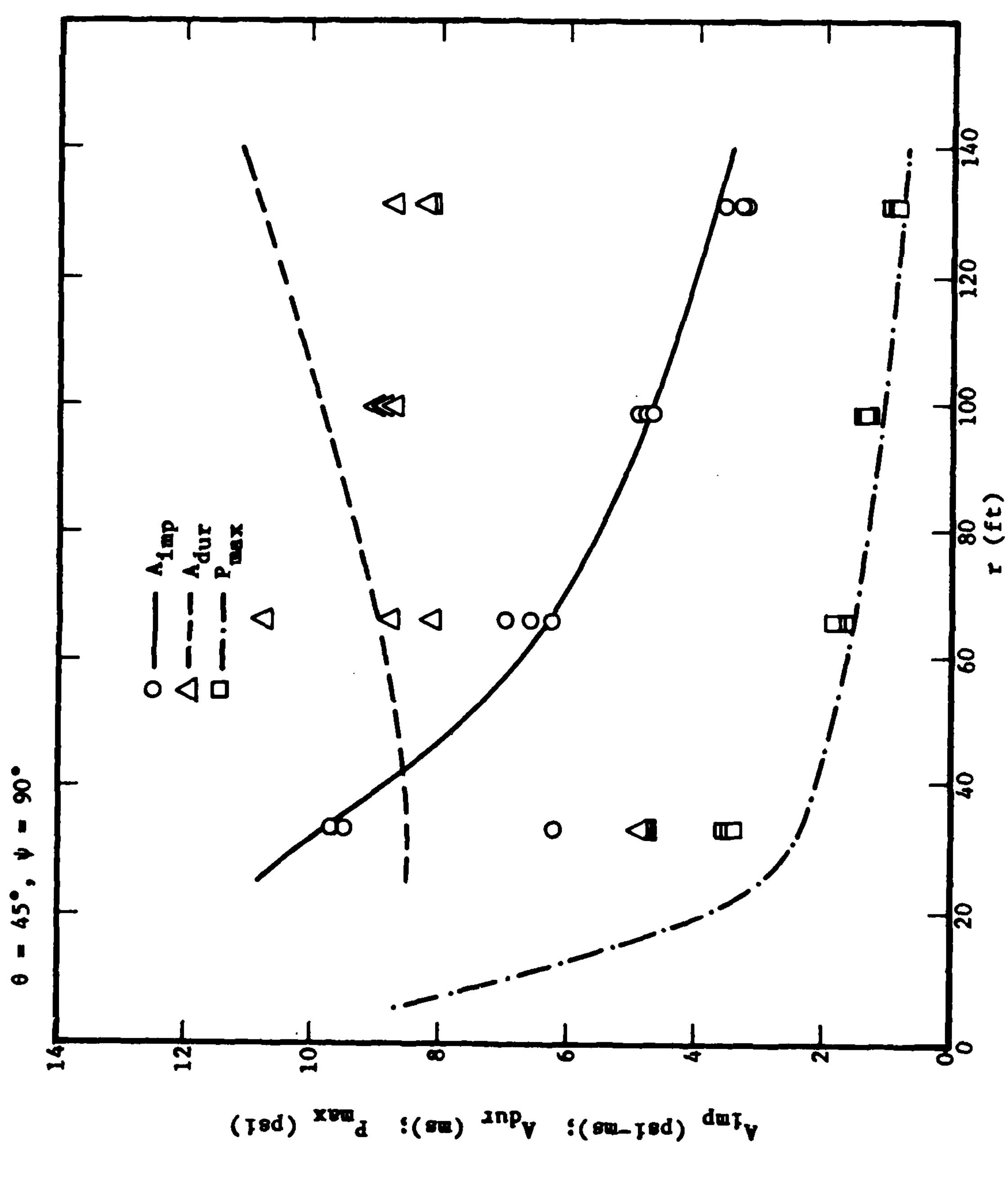

θ = 45°, ψ = 60°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

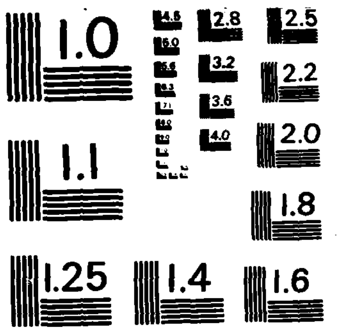
Figure 18(c)



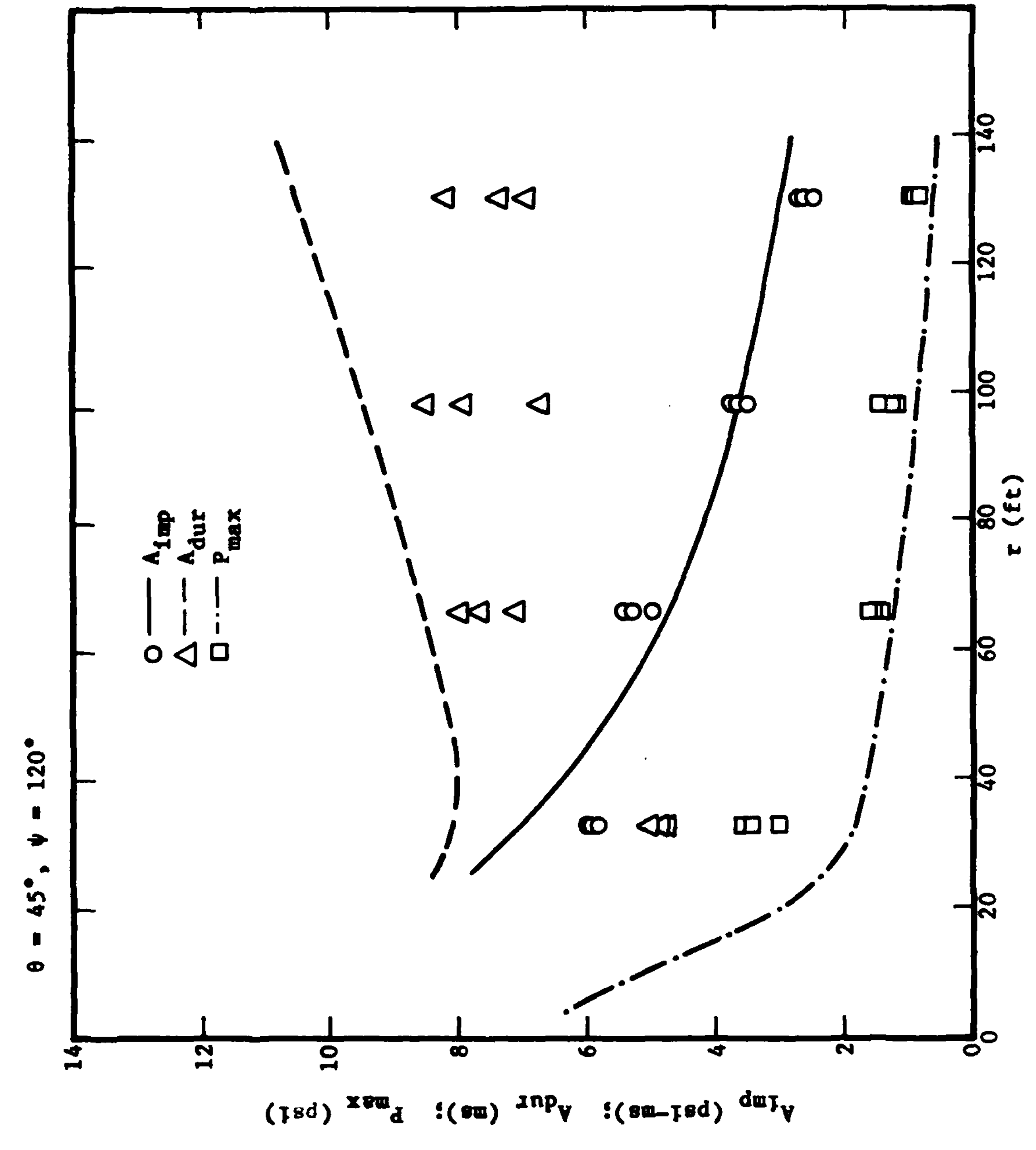
θ = 45°, ψ = 90°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 18(d)

AD-A139 670 TEST PLANNING COLLECTION AND ANALYSIS OF PRESSURE DATA 2/4
RESULTING FROM WEAPON SYSTEMS(U) JAYCOR SAN DIEGO CA
J H STUHMILLER ET AL. OCT 81 JAYCOR-J520-81-007
UNCLASSIFIED DAMD17-80-C-0104 F/G 19/6 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A



θ = 45°, ψ = 120°
A_{imp}
A_{dur}
P_{max}
A_{imp} (psi-ms); A_{dur} (ms); P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 18(e)

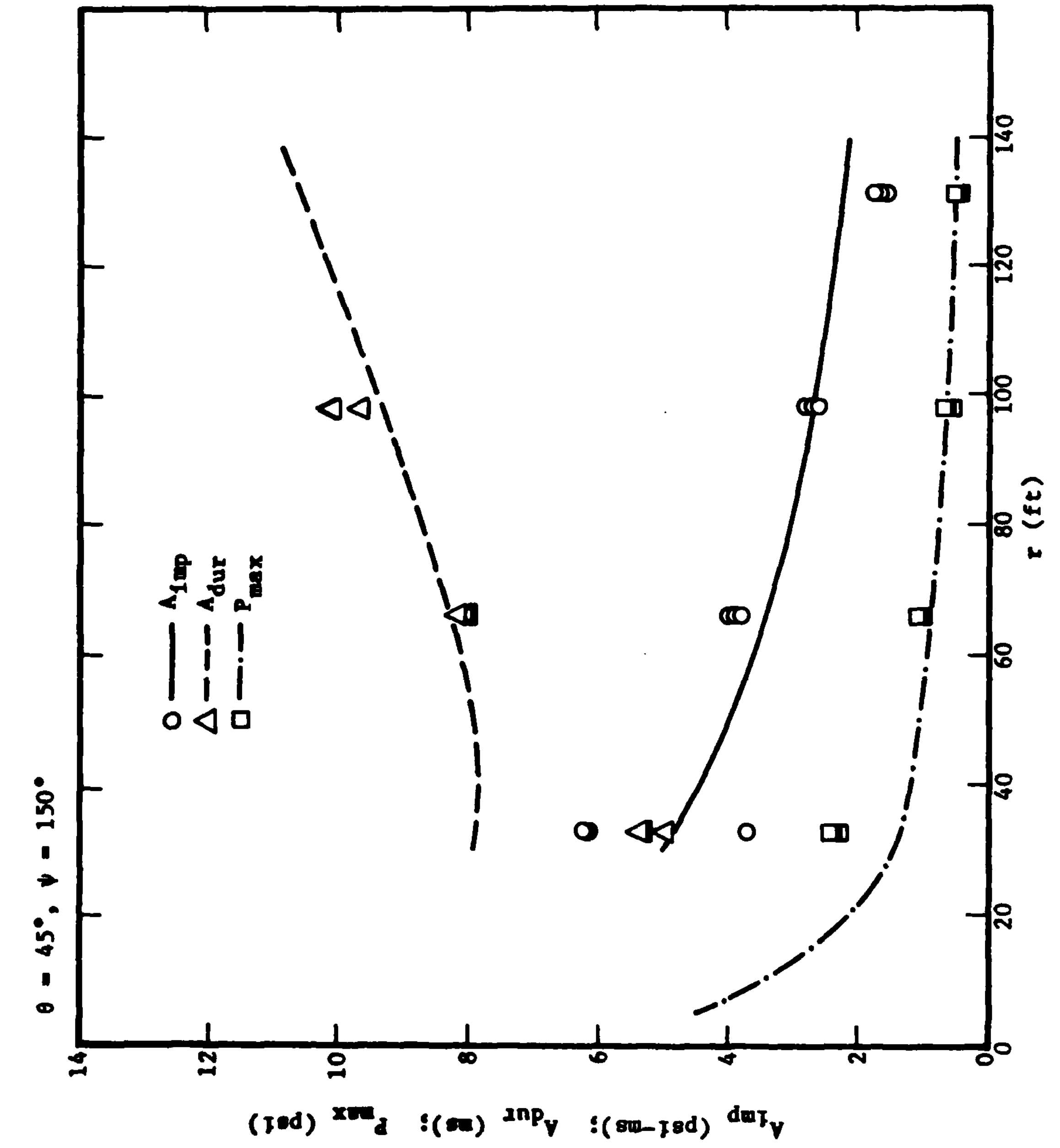
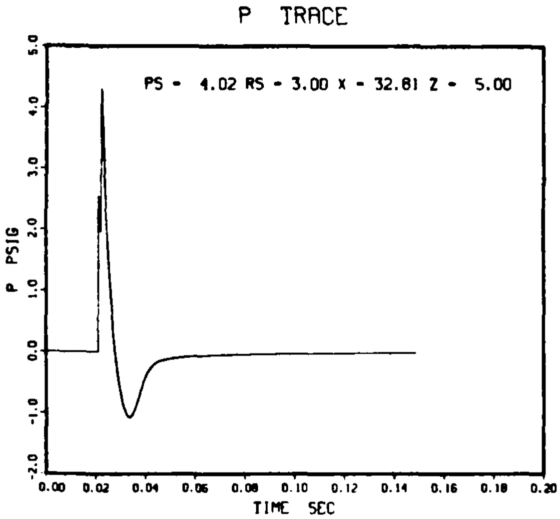
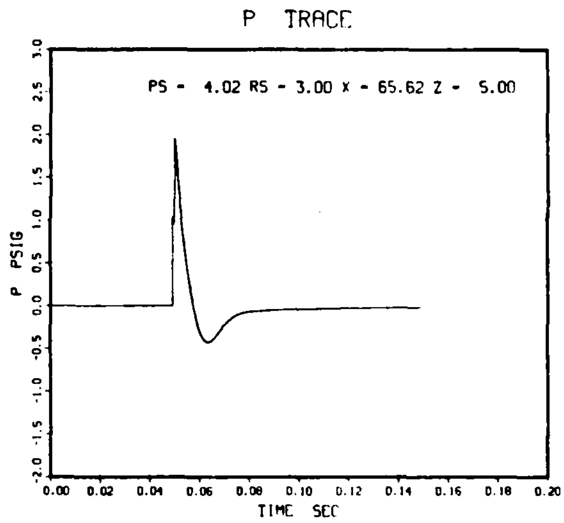

θ = 45°, ψ = 150°
A_imp
A_dur
P_max
A_imp (psi-ms); A_dur (ms); P_max (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 18(f)

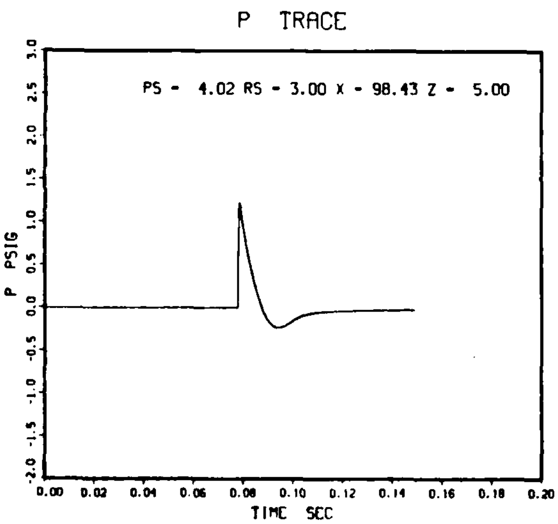
$\theta = 2.53°$, $\psi = 60°$



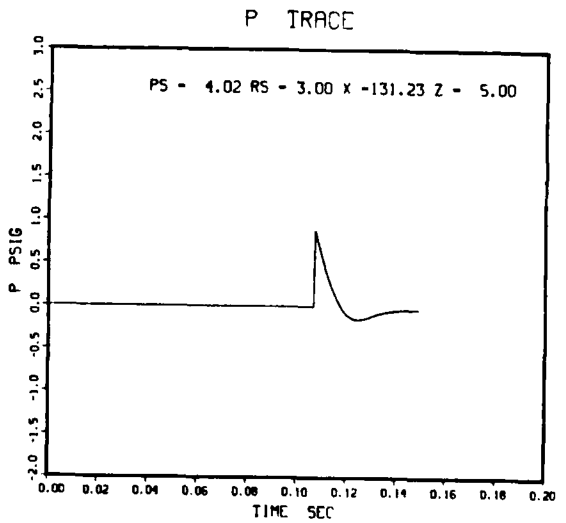
R = 10 m



R = 20 m



R = 30 m



R = 40 m

Figure 19

concentrated on its values at other distances. Figures 16-18 show that the calculated A-impulse at $r = 10$ meters is often smaller than the measured values. We think that this discrepancy may be due to the nonlinear effects of ground reflection that are not included in the present treatment. Since the shock waves are stronger at nearer distances, the nonlinear effects are also stronger there. This discrepancy is not large, however, at all and does not exceed 20%.

In summary, comparison of calculations and field data presented in this section has shown that the BLAST code is capable of describing the blast wave generated by the M198 howitzer. Apart from possible nonlinear effects in the near field, the code satisfactorily reproduces the pressure-time history, maximum overpressure, A-impulse and A-duration for all azimuthal orientation and for the three gun elevations considered.

2.3 CATALOG OF BLAST PARAMETERS AND WAVE FORMS

We present here a catalog of blast parameters and wave forms as obtained from calculations by use of the BLAST code. This will facilitate quick reference to the blast wave properties without performing new computer runs with the specific situation at hand. A typical situation would be the case where a certain physical quantity such as the A-impulse or the maximum overpressure at a certain location is known and it is desired to find other information such as the pressure-time history of the blast wave. With the help of the catalog complete information can be obtained on the physical quantities at that location and other locations along the same radial line from the muzzle.

As explained in Section 2.1, the calculation along each radial line is an independent calculation on its own right. The only parameters in the calculation along a radial line are the height H of the muzzle from the ground and the initial pressure P_s. (The radius r_o of the initial pressurized balloon is conveniently chosen to be 3 feet and the height z of the observation points is fixed at 5 feet.) In Section 2.2 where the M198 howitzer is considered specifically, the height of the muzzle is determined by the gun elevation angle θ. In the catalog, it is preferable to use the height H instead of the elevation θ, since the application of the catalog to other guns is foreseeable. Note also that the azimuthal angle ψ is not a parameter in the calculation. It is

only a label for a specific radial line in the calculation. The catalog presents tables and graphs of maximum static overpressure. A-impulse and A-duration and graphs of pressure-time history for muzzle height H at 5, 10, 15 and 20 feet and for initial pressures P_s at 2, 4, 6, 8, 10 and 12 atmospheres.

In order to illustrate the usage of the catalog, two examples are discussed.

Example 1:

Suppose in a firing of a certain gun whose muzzle is 10 feet about the ground, the A-impulse is measured to be 5.0 psi-ms at the 100 ft position on the line with an azimuthal angle of 60°. With this information, one can locate in the catalog the tables and figures with the muzzle height value H = 10 ft. In the table of A-impulse values (Table 6b) the entries in the horizontal row with r = 100 ft can be compared with the measured value 5.0 psi-ms. In this case the value 5.10 psi-ms is near to the desired value 5.0 psi-ms. Since this value of 5.10 psi-ms is located in the last column of the table, it fixes the initial pressure P_s = 12 atm. With this P_s value one can then find that at the same point the maximum overpressure is 1.19 psi (from Table 6a), the A-duration is 9.59 ms (from Table 6c) and the pressure-time history is shown in Figure 23f. Information at other distances along this 60° azimuthal line can also be found under the entries with P_s = 12 atm. For example, at 50 ft along this line, the maximum overpressure is 2.50 psi, A-impulse is 9.03 psi-ms, A-duration is 7.95 ms, and the pressure-time history is shown in Figure 23f.

In the case that the measure value of A-duration (e.g., 5 psi-ms) does not come close to any single calculated value but lies in between the values in two adjacent columns, one can use interpolation to find a rough estimate of the quantities discussed above.

Example 2:

The catalog can be also used for open charges. If the charge is a spherical charge, the blast wave will not depend on the azimuthal angle ψ and the values in the catalog are applicable to all ψ values. In order to make the

catalog more useful in the case of open charge, we give in Table 4 the equivalence of pounds of TNT and the initial pressurized balloon with radius equal to 3 ft and pressure equal to P_s.

Suppose we have an open charge of 2 lb of TNT which is detonated 15 ft above the ground. We want to find the blast wave properties at all locations in the field. Since 1.90 lb is quite close to 2 lb, we use the equivalent P_s = 6 atm for the 1.90 lb TNT for a rough estimate. (One can interpolate between 1.90 lb and 2.65 lb to find the more accurate equivalent P_s to 2.0 lb from Table 4.) Then, the maximum overpressure, A-impulse and A-duration at various radial distances from the charge are given in column 3 of Tables 7a, b, and c, respectively. The pressure-time histories can be found in Figure 25c.

Table 4.

	P_s (atm)					
	2	4	6	8	10	12
TNT (lb)	0.38	1.14	1.90	2.65	3.41	4.17

Table 5. (H = 5 ft)**

r (ft)	P_s (atm) 2	4	6	8	10	12
	a. Maximum Static Overpressure (psi)					
10	2.26*	4.58*	6.84*	10.11*	13.14	14.99
20	1.10	2.21	3.22	4.21	5.40	6.87
30	0.85	1.63	2.33	3.03	3.85	4.81
40	0.72	1.28	1.83	2.39	2.92	3.51
50	0.59	1.05	1.45	1.85	2.29	2.79
60	0.50	0.88	1.18	1.53	1.86	2.23
70	0.43	0.76	1.07	1.29	1.59	1.88
80	0.38	0.68	0.89	1.12	1.36	1.60
90	0.33	0.59	0.77	0.99	1.20	1.40
100	0.30	0.53	0.70	0.87	1.05	1.24
110	0.28	0.47	0.63	0.78	0.95	1.12
120	0.26	0.43	0.57	0.72	0.86	1.01
	b. A-Impulse (psi-ms)					
10	2.07*	4.28*	6.54*	9.79*	19.62	23.16
20	2.39	5.06	7.79	10.64	14.27	18.10
30	1.97	3.93	5.73	8.13	10.52	13.90
40	1.74	3.30	4.86	6.72	8.59	10.87
50	1.54	2.85	4.14	5.51	7.23	9.12
60	1.43	2.53	3.55	4.85	6.20	7.84
70	1.29	2.33	3.26	4.24	5.58	6.92
80	1.21	2.19	3.00	3.92	4.95	6.18
90	1.16	2.04	2.75	3.62	4.59	5.55
100	1.09	1.93	2.62	3.33	4.17	5.18
110	1.05	1.85	2.47	3.10	3.92	4.82
120	1.01	1.74	2.31	2.97	3.65	4.45
	c. A-Duration (ms)					
10	2.26*	2.41*	2.59*	2.77*	5.10	4.92
20	4.58	4.77	5.08	5.33	5.63	5.81
30	5.00	5.16	5.36	5.82	6.06	6.50
40	5.54	5.67	5.89	6.26	6.59	6.97
50	6.14	6.13	6.38	6.66	7.07	7.40
60	6.77	6.63	6.78	7.12	7.46	7.89
70	7.24	7.16	7.37	7.47	7.89	8.27
80	7.85	7.70	7.82	7.99	8.20	8.68
90	8.44	8.22	8.27	8.37	8.67	8.95
100	8.87	8.76	8.75	8.78	9.02	9.39
110	9.42	9.28	9.21	9.18	9.37	9.69
120	9.81	9.65	9.53	9.59	9.73	10.00

**In this and the following tables, an asterisk denotes a case where the pressure decreases to ambient before the ground reflection peak arrives. Since the A-duration is defined as the time of the first passage of the pressure to the ambient, the calculation of the A-duration and A-impulse counts only the first (direct incident) peak in such a case. Those values are considerably smaller than those where both the direct incident and the ground reflection peaks are counted, and are not plotted in the graphs. The maximum overpressure is not affected by this early passage to ambient.

H = 5 ft

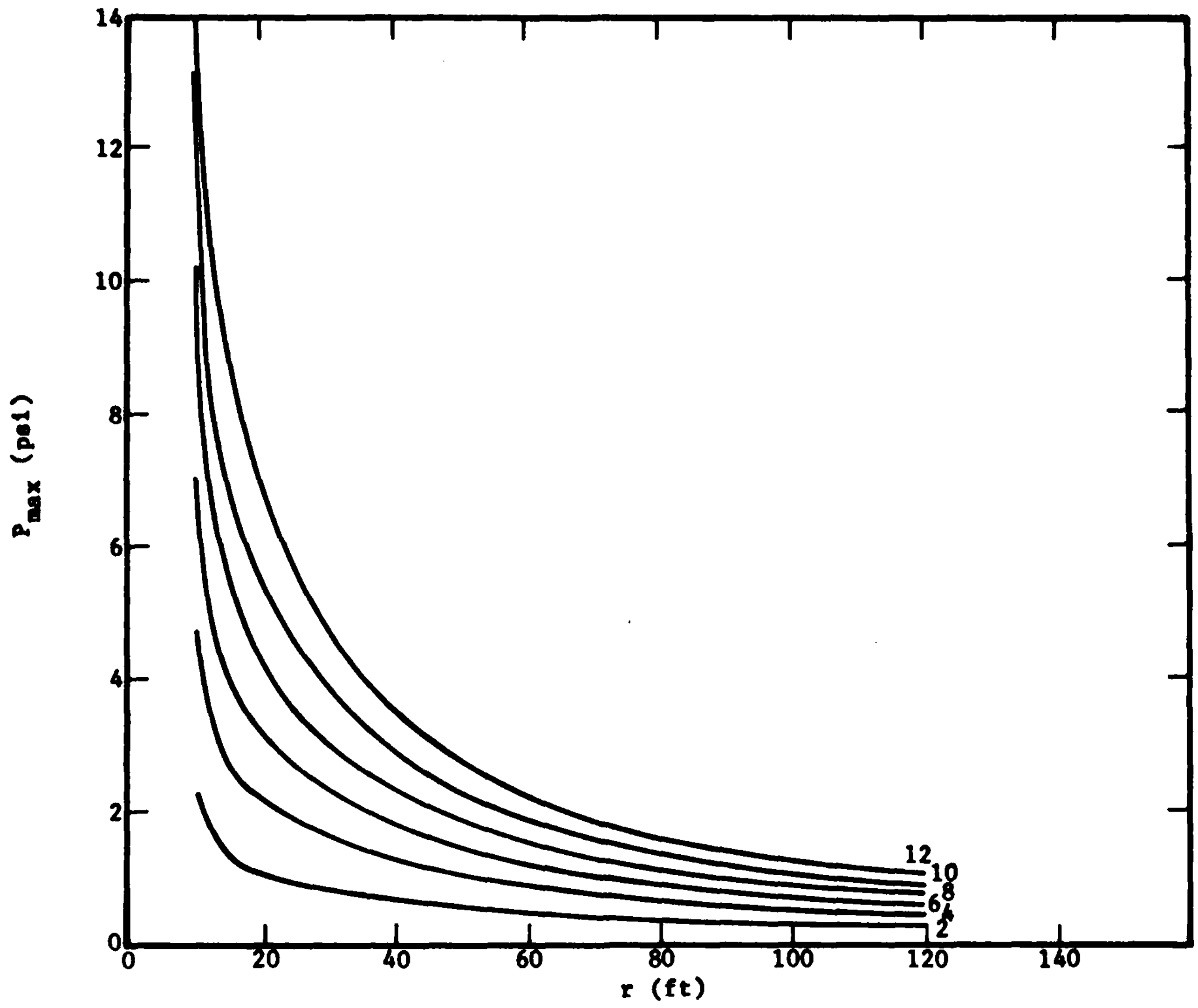


Figure 20(a)

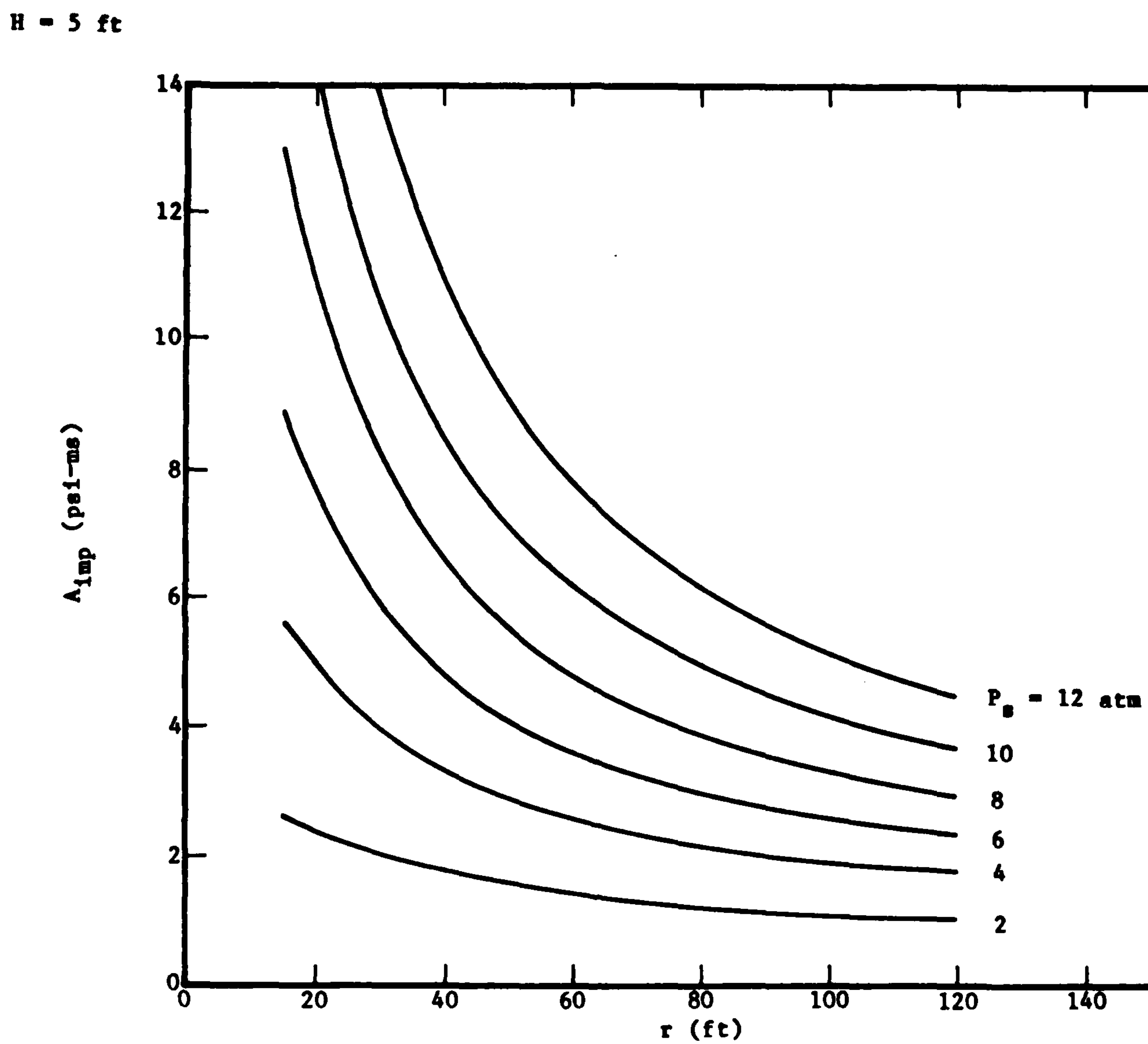

H = 5 ft
A_{imp} (psi-ms)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
r (ft)
P_s = 12 atm
10
8
6
4
2

Figure 20(b)

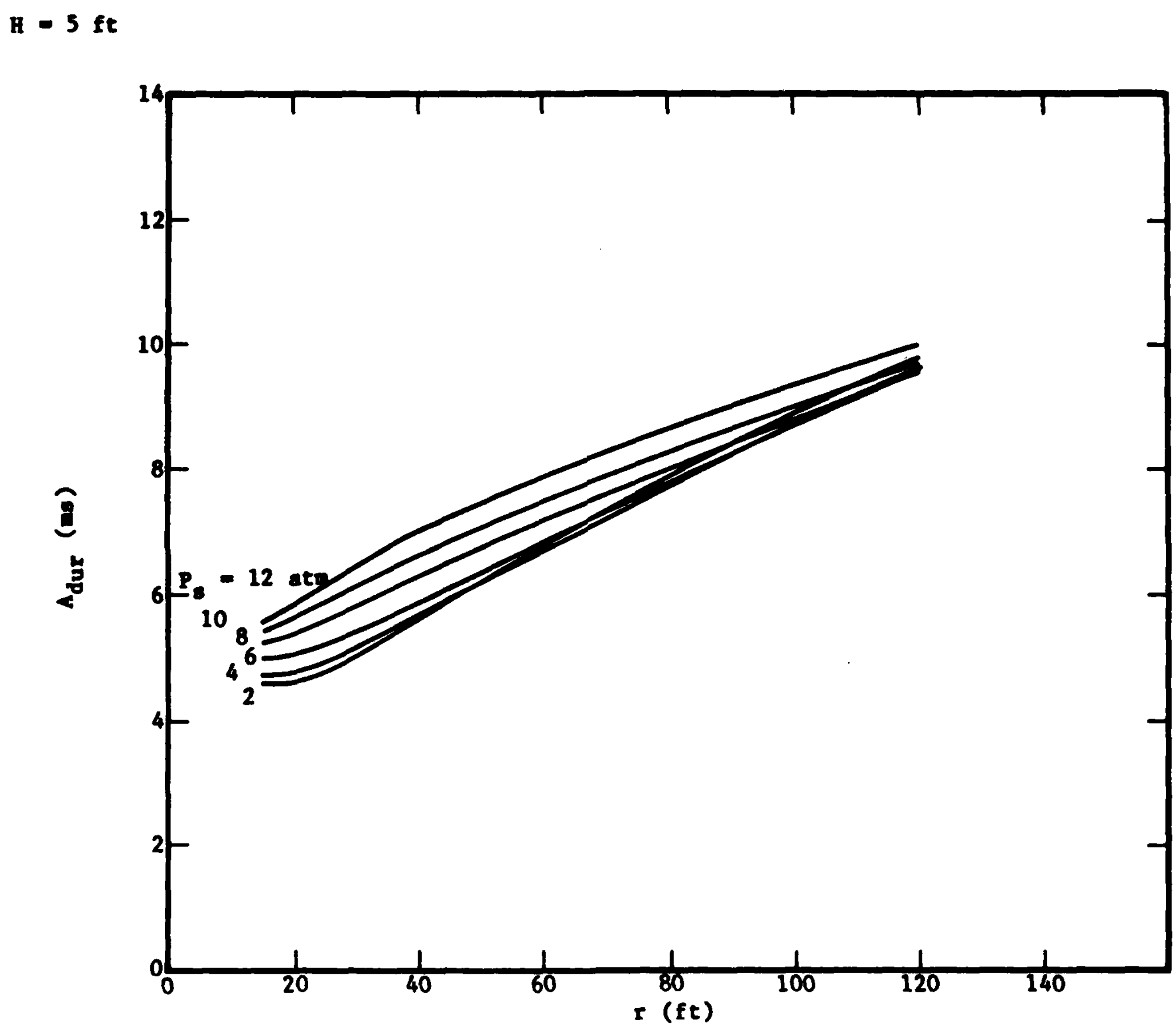
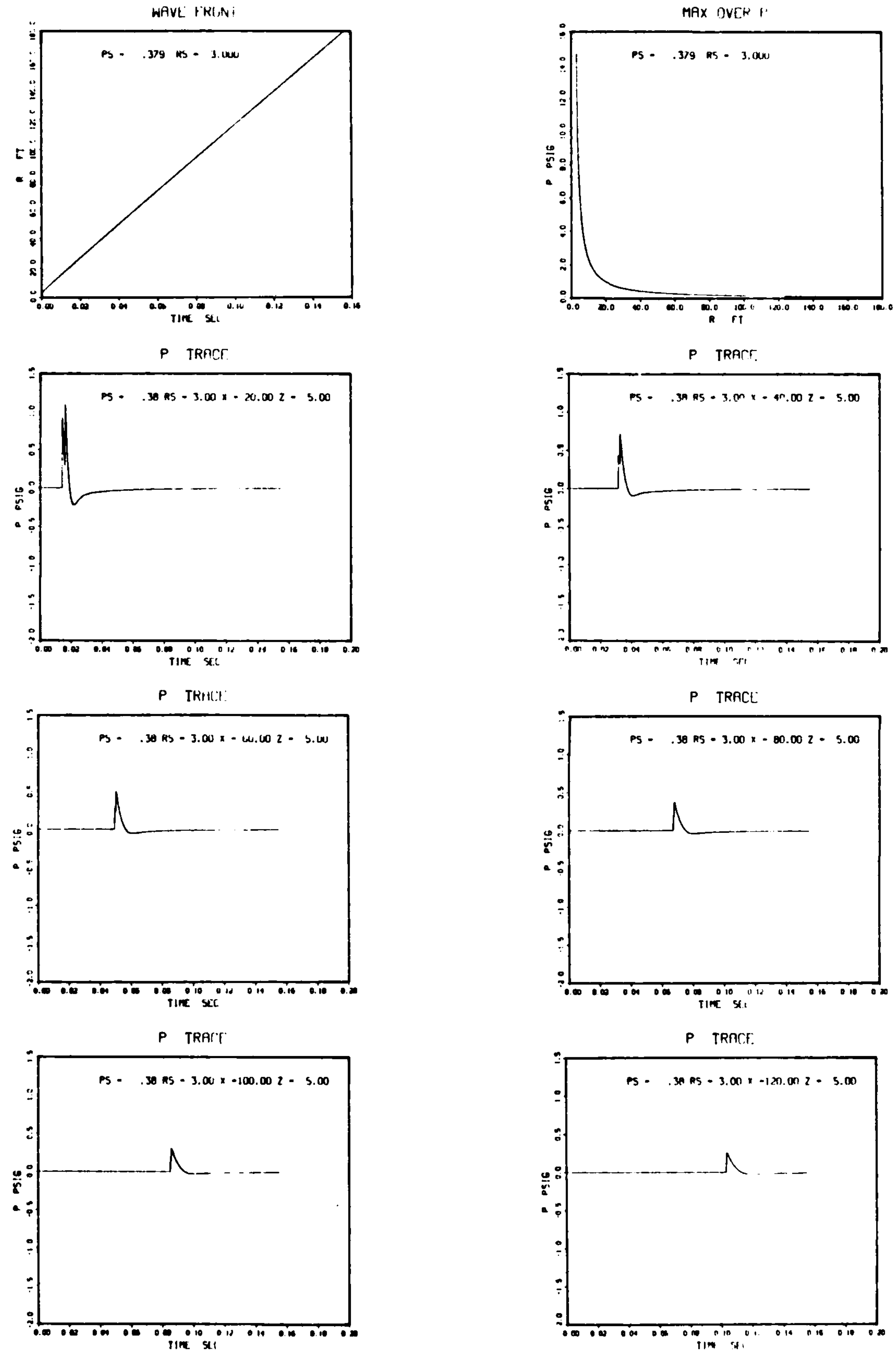

H = 5 ft
P_s = 12 atm
10
8
6
4
2
A_{dur} (ms)
0
2
4
6
8
10
12
14
0
20
40
60
80
100
120
140
r (ft)

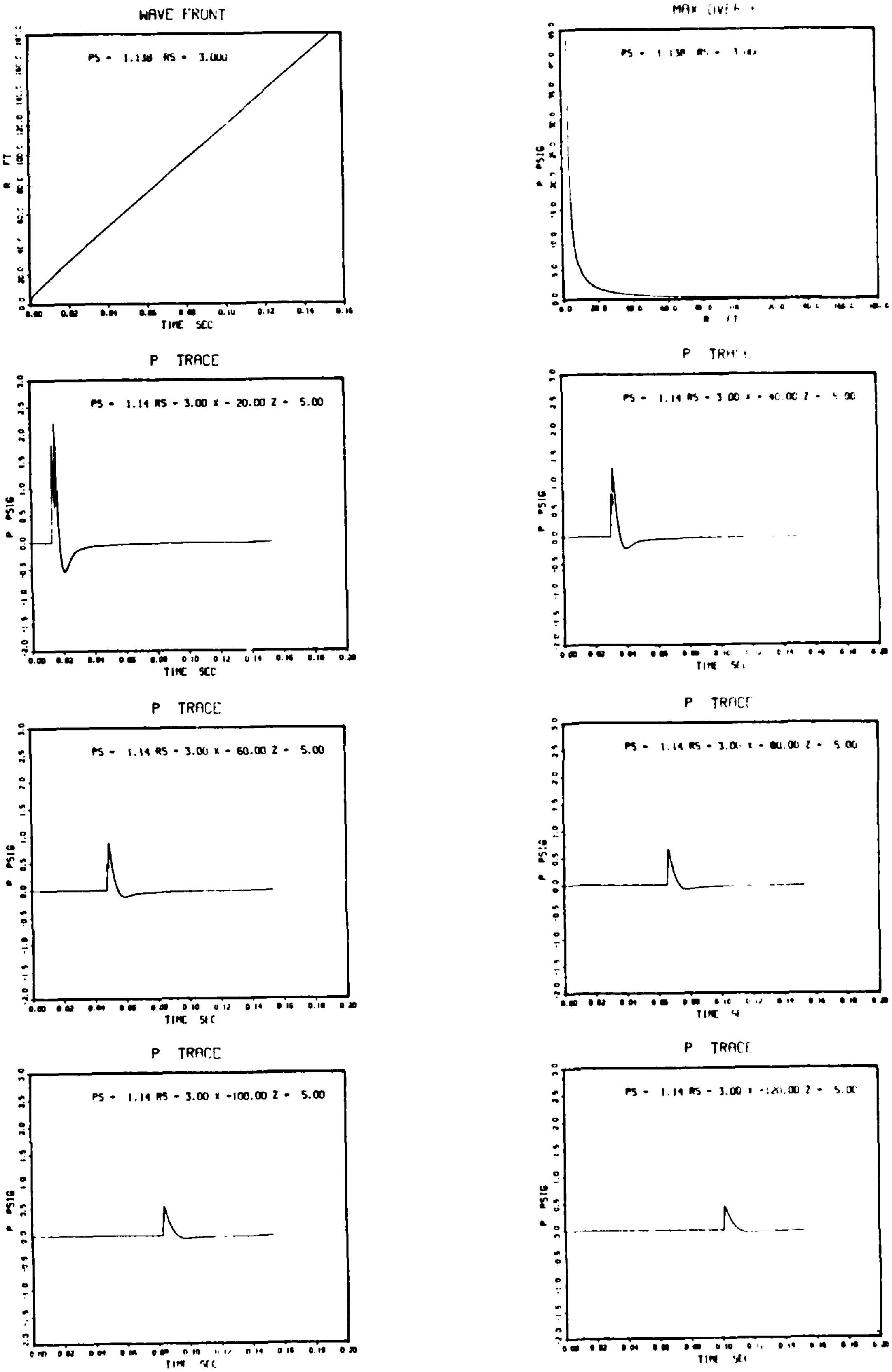
Figure 20(c)



Source Height = 5 feet

P_o = 0.38

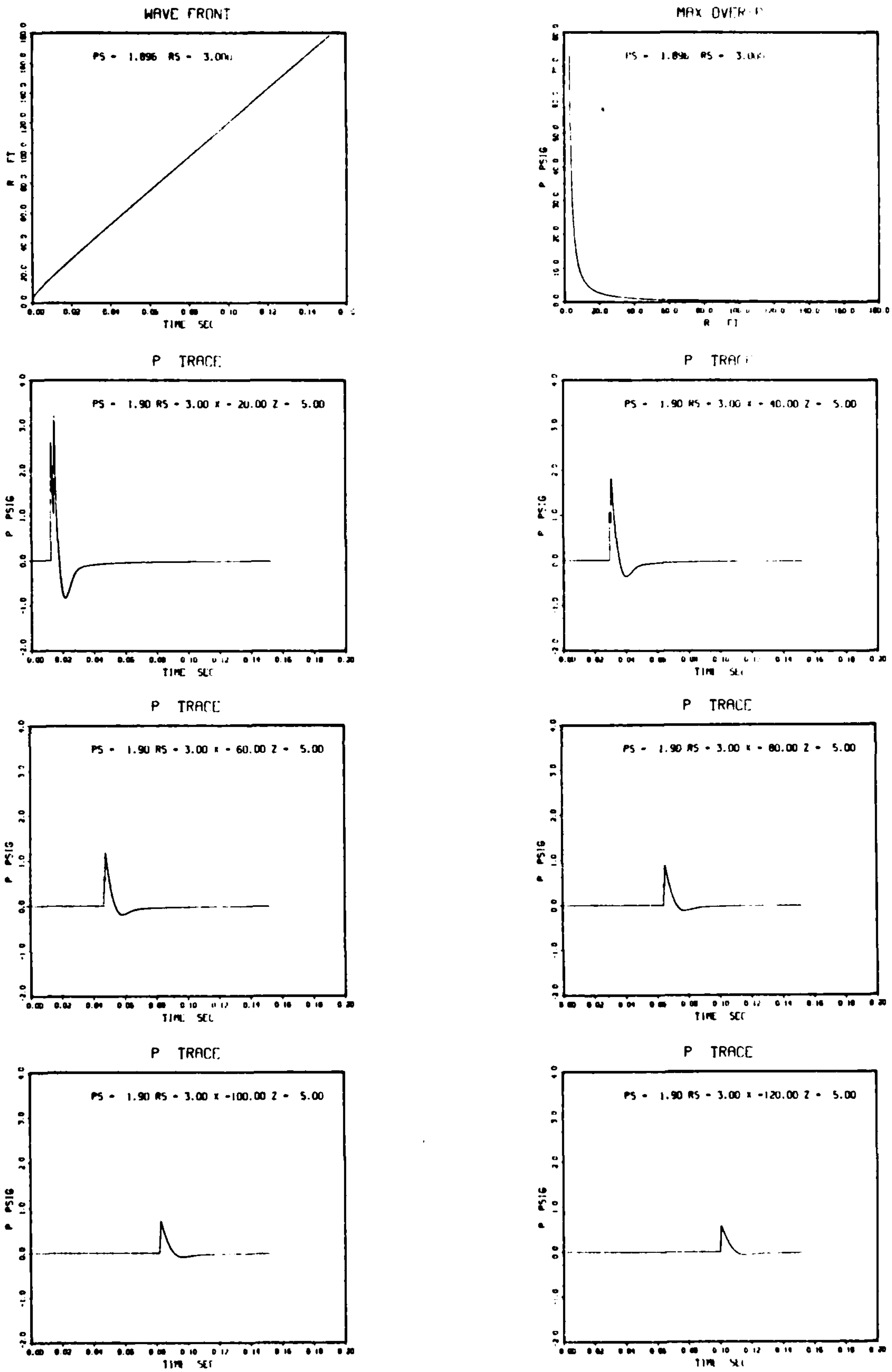
Figure 21(a)



Source Height = 5 feet

P_o = 1.14

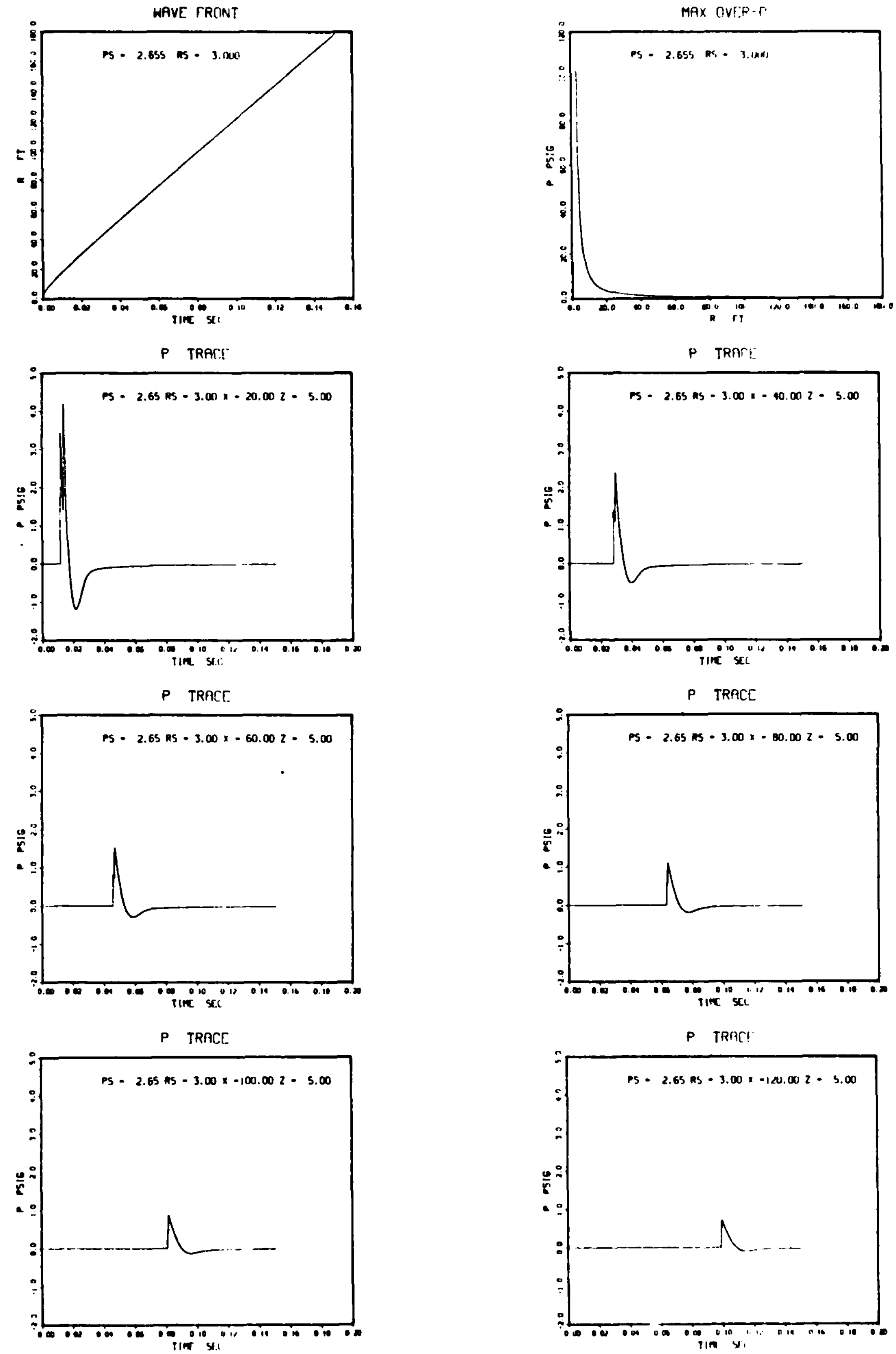
Figure 21(b)



Source Height = 5 feet

$P_o = 1.90$

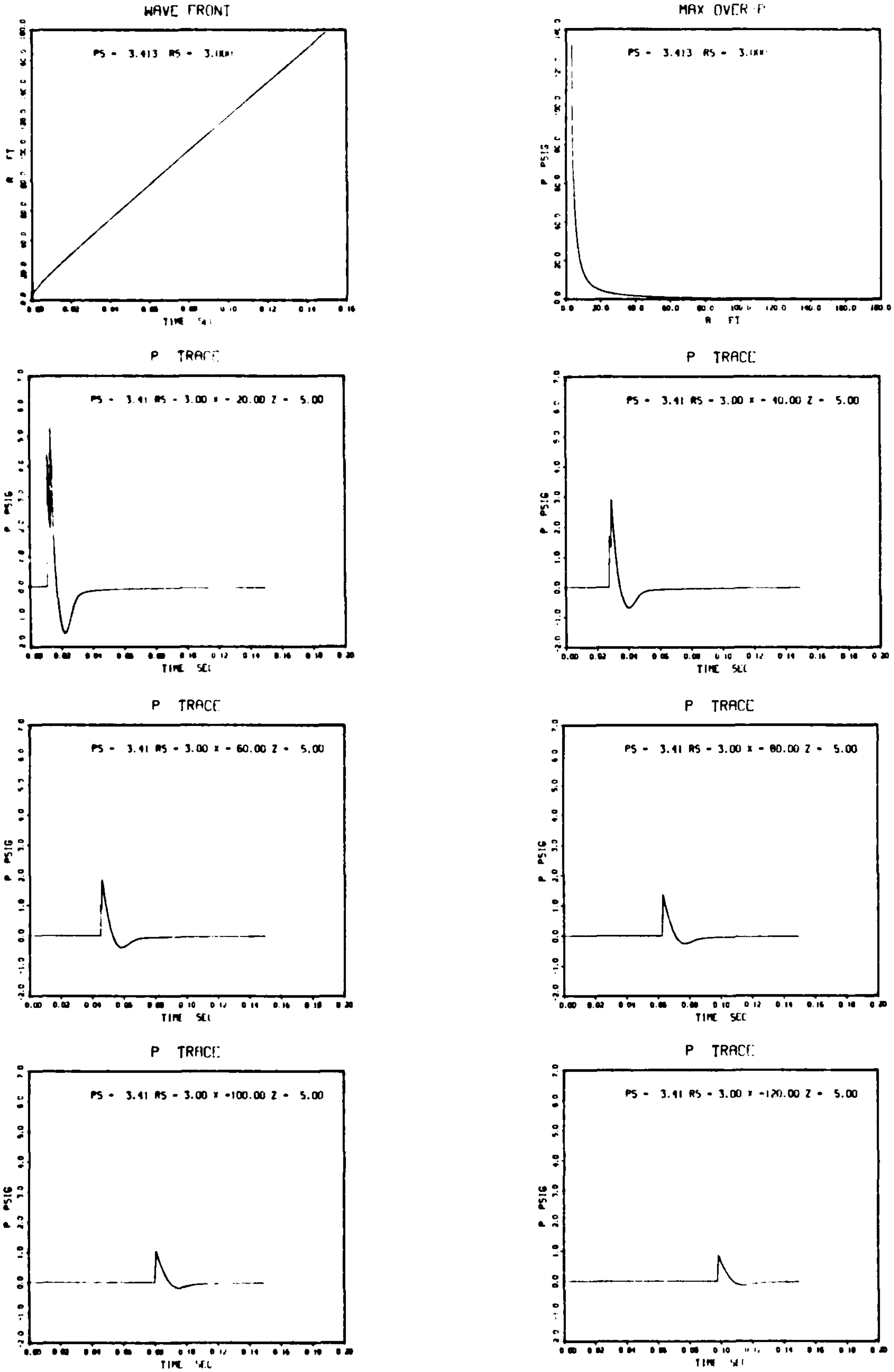
Figure 21(c)



Source Height = 5 feet

P_o = 2.65

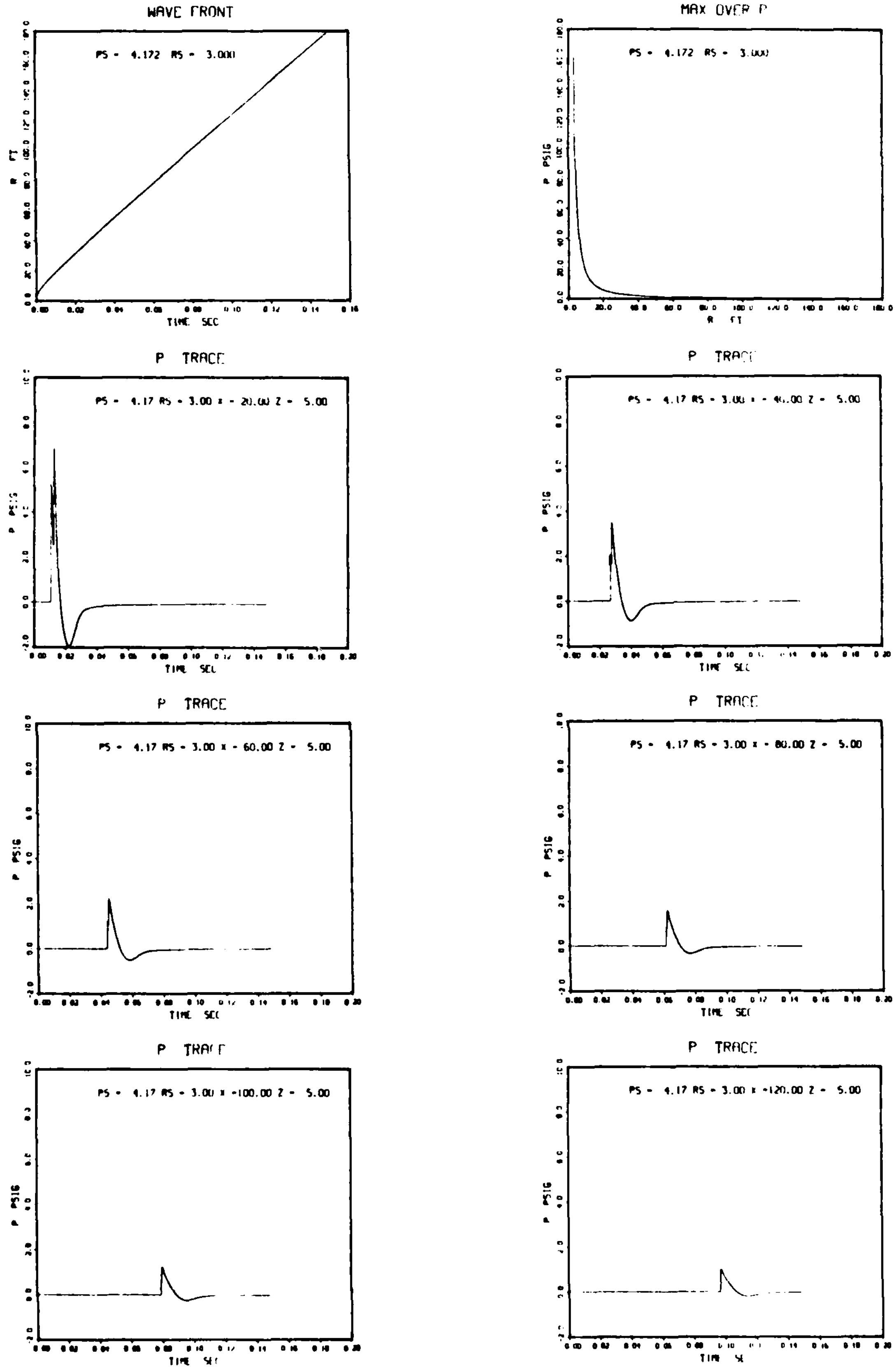
Figure 21(d)



Source Height = 5 feet

P_o = 3.41

Figure 21(e)



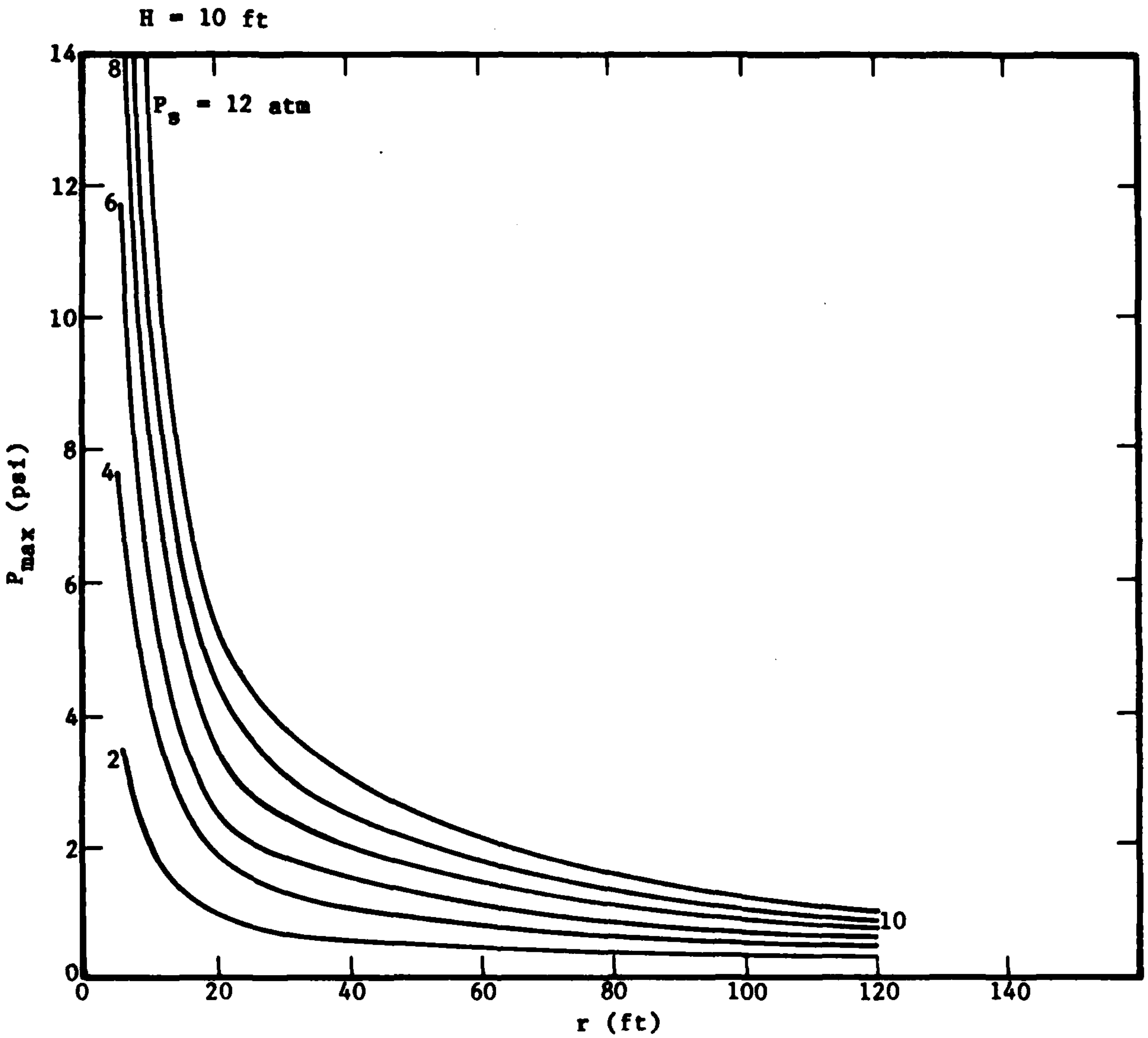
Source Height = 5 feet

P_o = 4.17

Figure 21(f)

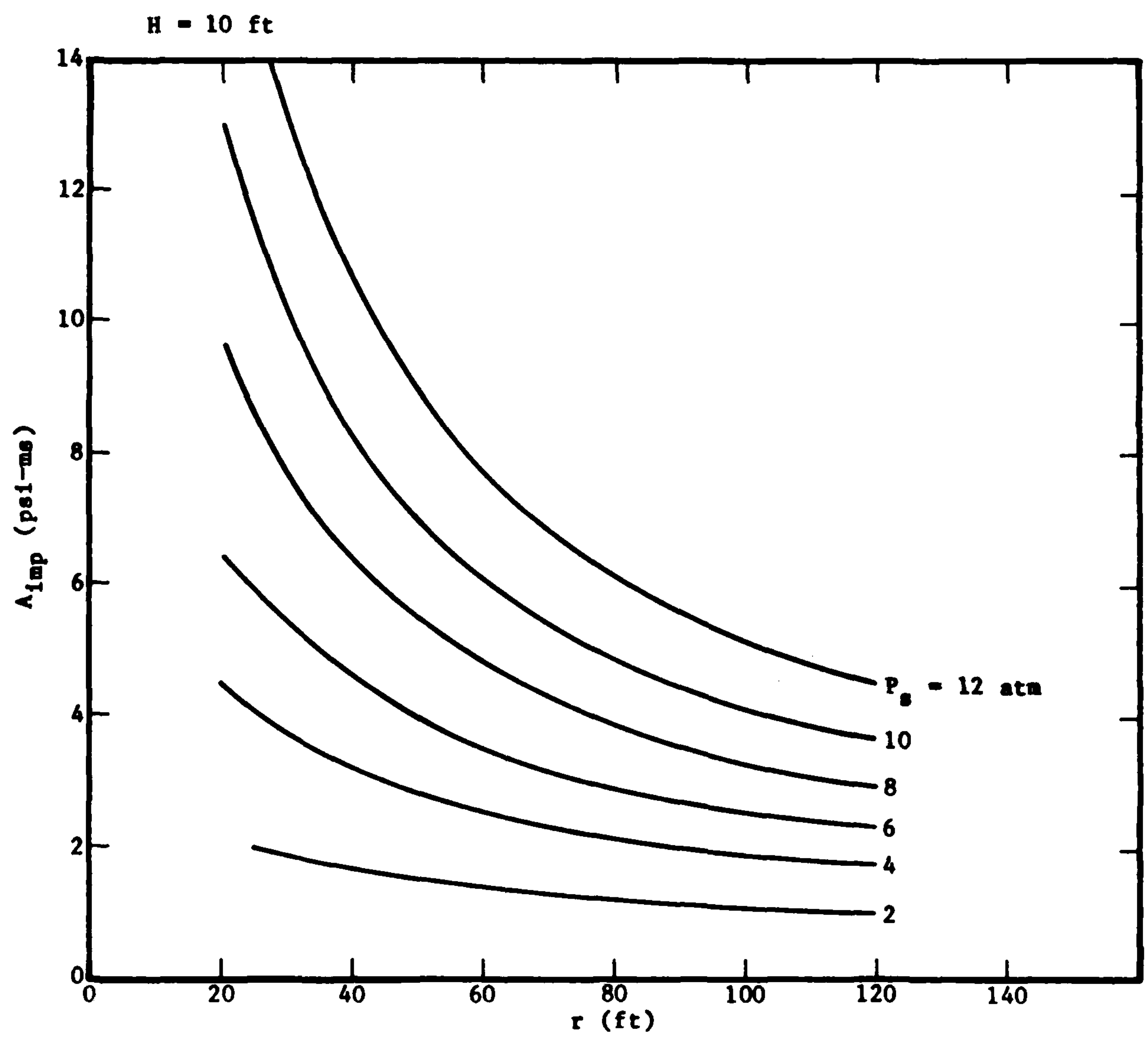
Table 6.
(H = 10 ft)

r (ft)	P_s (atm) 2	4	6	8	10	12
			a. Maximum Static Overpressure (psi)			
10	1.89*	4.03*	5.78*	8.15*	10.21*	12.83*
20	0.93*	1.83	2.44	3.38	4.31	5.13
30	0.65	1.24	1.78	2.46	3.14	3.75
40	0.58	1.10	1.51	1.98	2.43	3.06
50	0.51	0.93	1.28	1.64	2.04	2.50
60	0.45	0.79	1.07	1.40	1.70	2.04
70	0.40	0.71	0.94	1.20	1.49	1.77
80	0.36	0.63	0.82	1.07	1.27	1.54
90	0.32	0.56	0.73	0.94	1.15	1.34
100	0.30	0.50	0.67	0.85	1.00	1.19
110	0.27	0.47	0.61	0.76	0.91	1.07
120	0.25	0.43	0.56	0.70	0.84	0.98
			b. A-Impulse (psi-ms)			
10	1.81*	4.09*	6.03*	8.67*	10.69*	13.17*
20	1.28*	4.49	6.49	9.72	12.96	16.34
30	1.83	3.60	5.46	7.69	10.28	13.14
40	1.67	3.25	4.61	6.37	8.14	10.58
50	1.50	2.85	4.00	5.48	6.98	9.03
60	1.43	2.52	3.52	4.81	6.14	7.76
70	1.35	2.32	3.17	4.22	5.55	6.87
80	1.27	2.15	2.95	3.94	4.85	6.19
90	1.21	2.03	2.73	3.59	4.56	5.61
100	1.12	1.90	2.58	3.34	4.10	5.10
110	1.05	1.84	2.47	3.09	3.90	4.80
120	1.02	1.76	2.33	2.95	3.69	4.49
			c. A-Duration (ms)			
10	2.33*	2.59*	2.77*	2.96*	2.99*	2.99*
20	3.31*	6.35	6.36	6.66	6.89	7.02
30	6.01	6.06	6.33	6.59	6.94	7.35
40	6.29	6.36	6.54	6.88	7.18	7.55
50	6.66	6.76	6.84	7.24	7.48	7.95
60	7.29	7.13	7.26	7.58	7.91	8.33
70	7.65	7.55	7.60	7.83	8.25	8.62
80	8.18	8.02	8.13	8.29	8.50	8.97
90	8.71	8.49	8.54	8.63	8.92	9.34
100	9.24	8.98	8.96	8.99	9.23	9.59
110	9.61	9.46	9.40	9.34	9.69	10.01
120	10.13	9.95	9.84	9.74	10.02	10.30



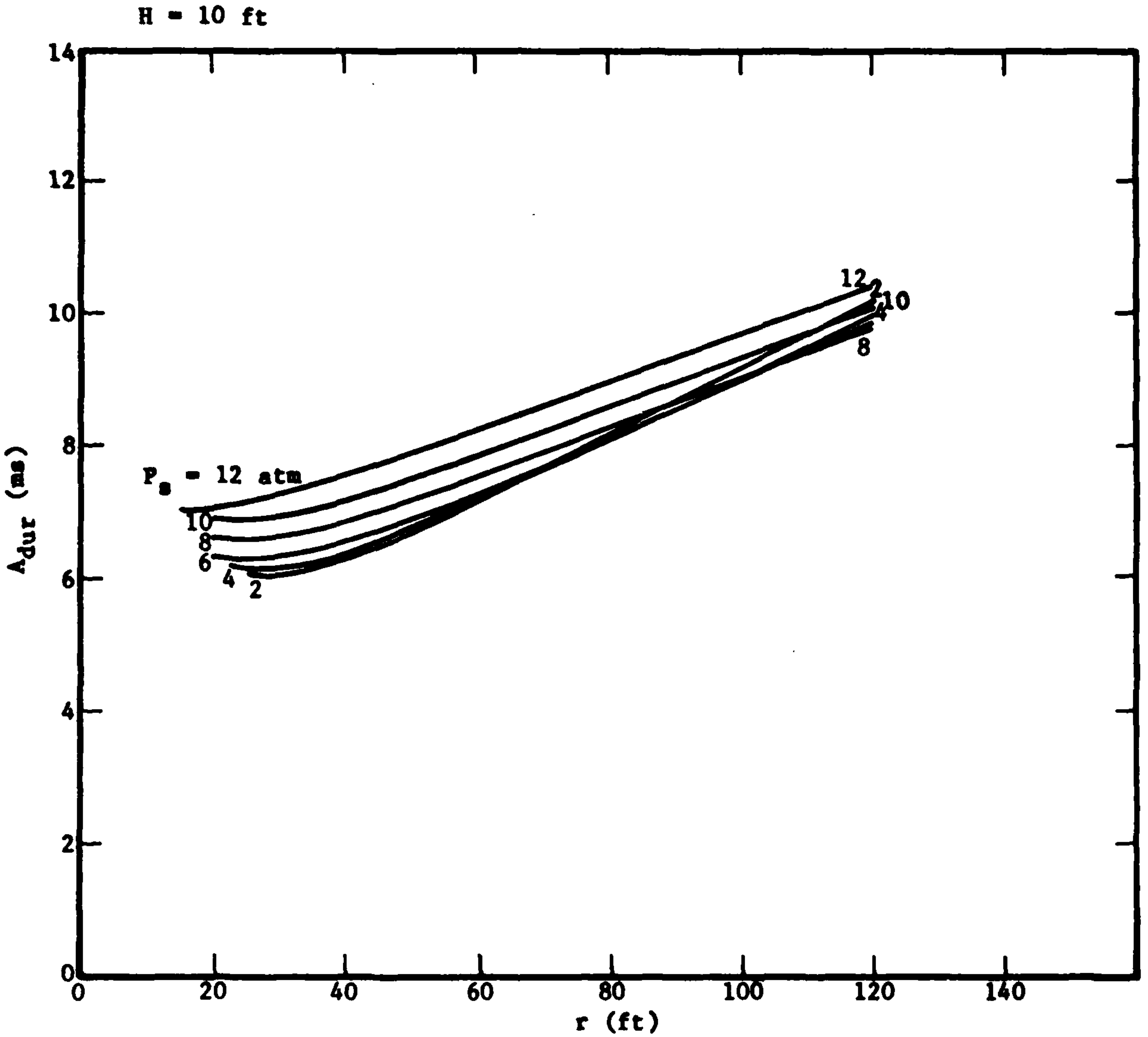
H = 10 ft
P_s = 12 atm
P_{max} (psi)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

Figure 22(a)



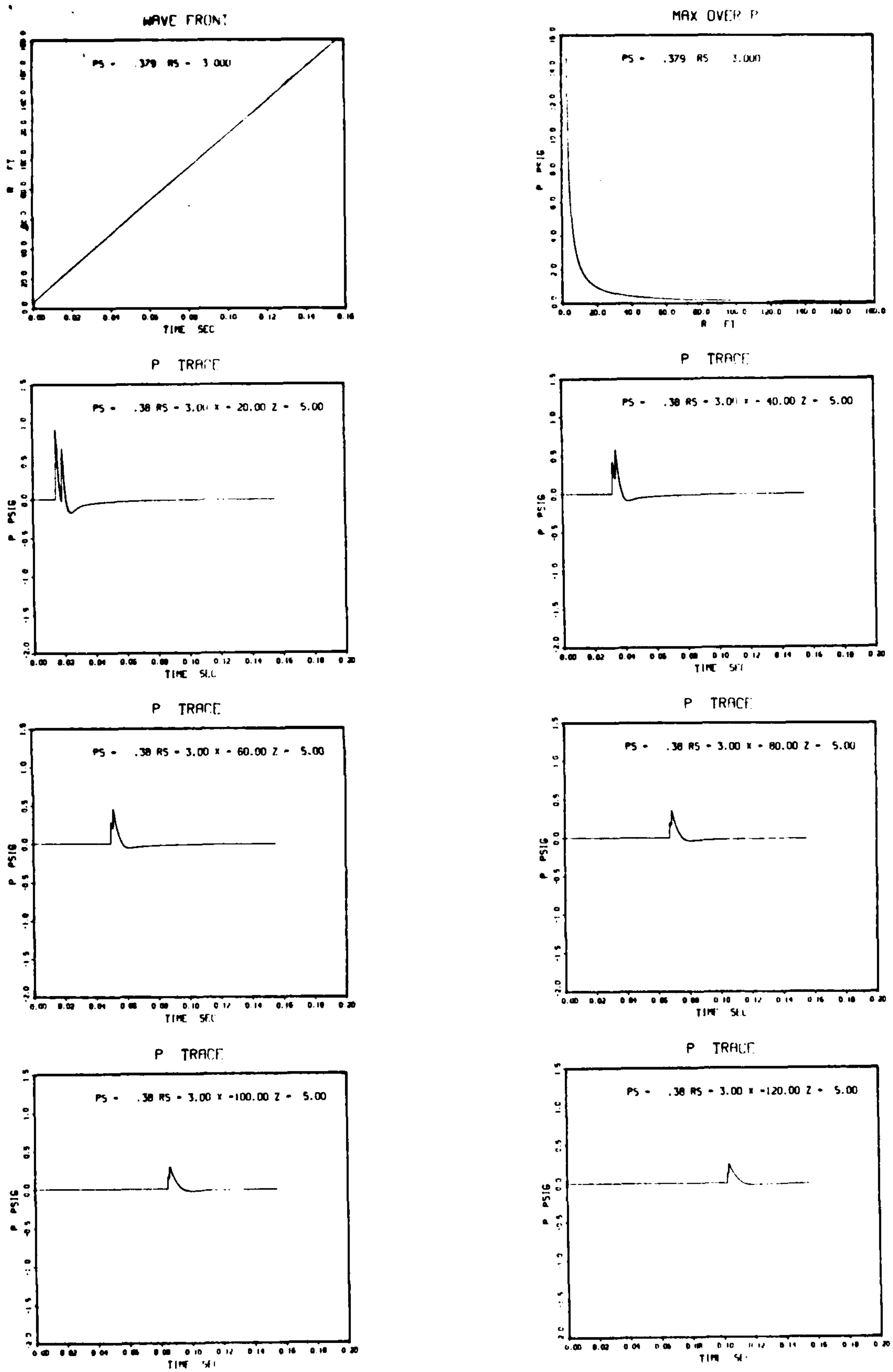
H = 10 ft
P_s = 12 atm
10
8
6
4
2
A_{imp} (psi-ms)
r (ft)
0
20
40
60
80
100
120
140
2
4
6
8
10
12
14

Figure 22(b)



H = 10 ft
P_s = 12 atm
10
8
6
4
2
12
2
10
4
8
14
12
10
8
6
4
2
0
A_{dur} (ms)
0
20
40
60
80
100
120
140
r (ft)

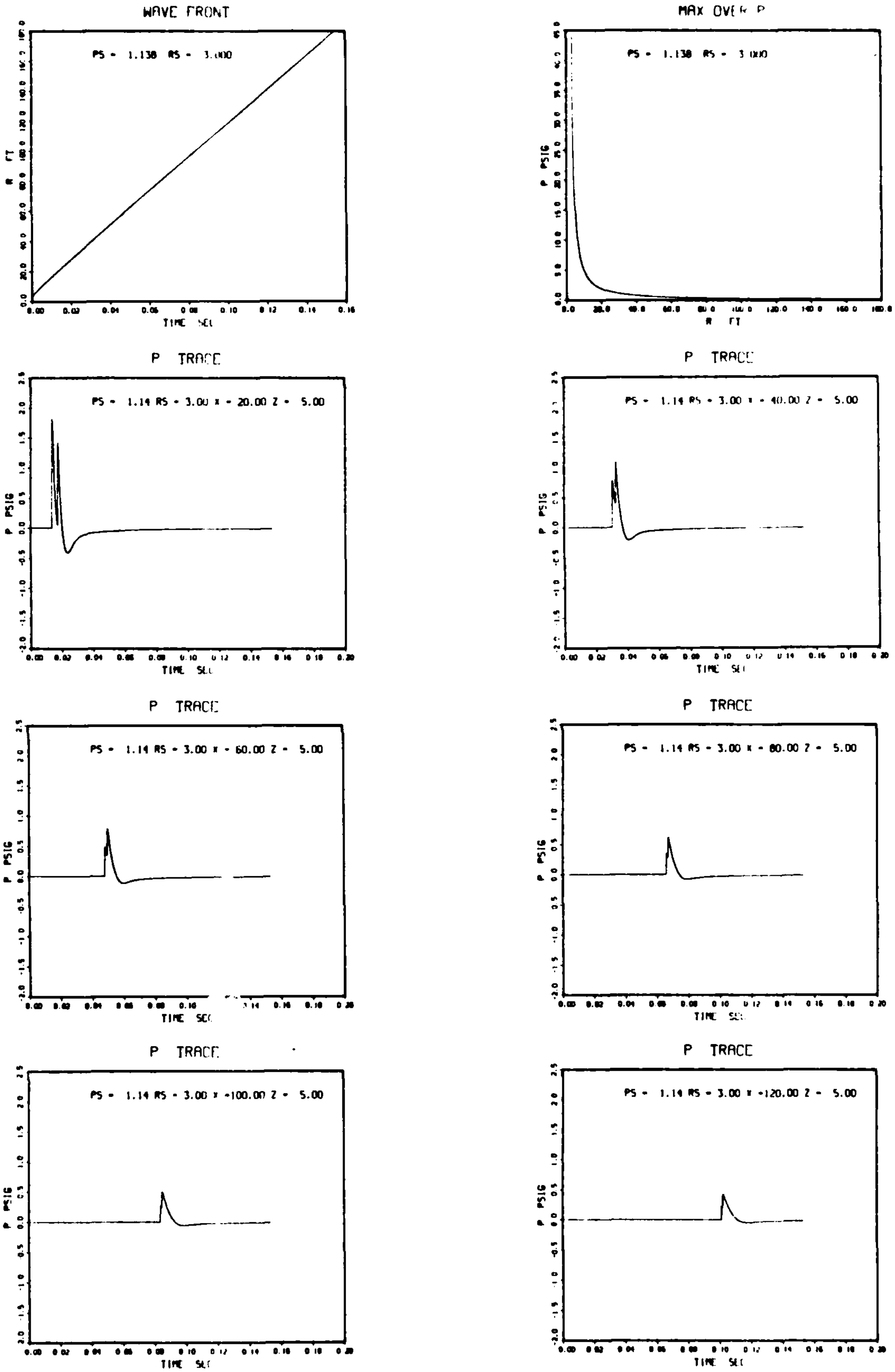
Figure 22(c)



Source Height = 10 feet

$P_o = 0.38$

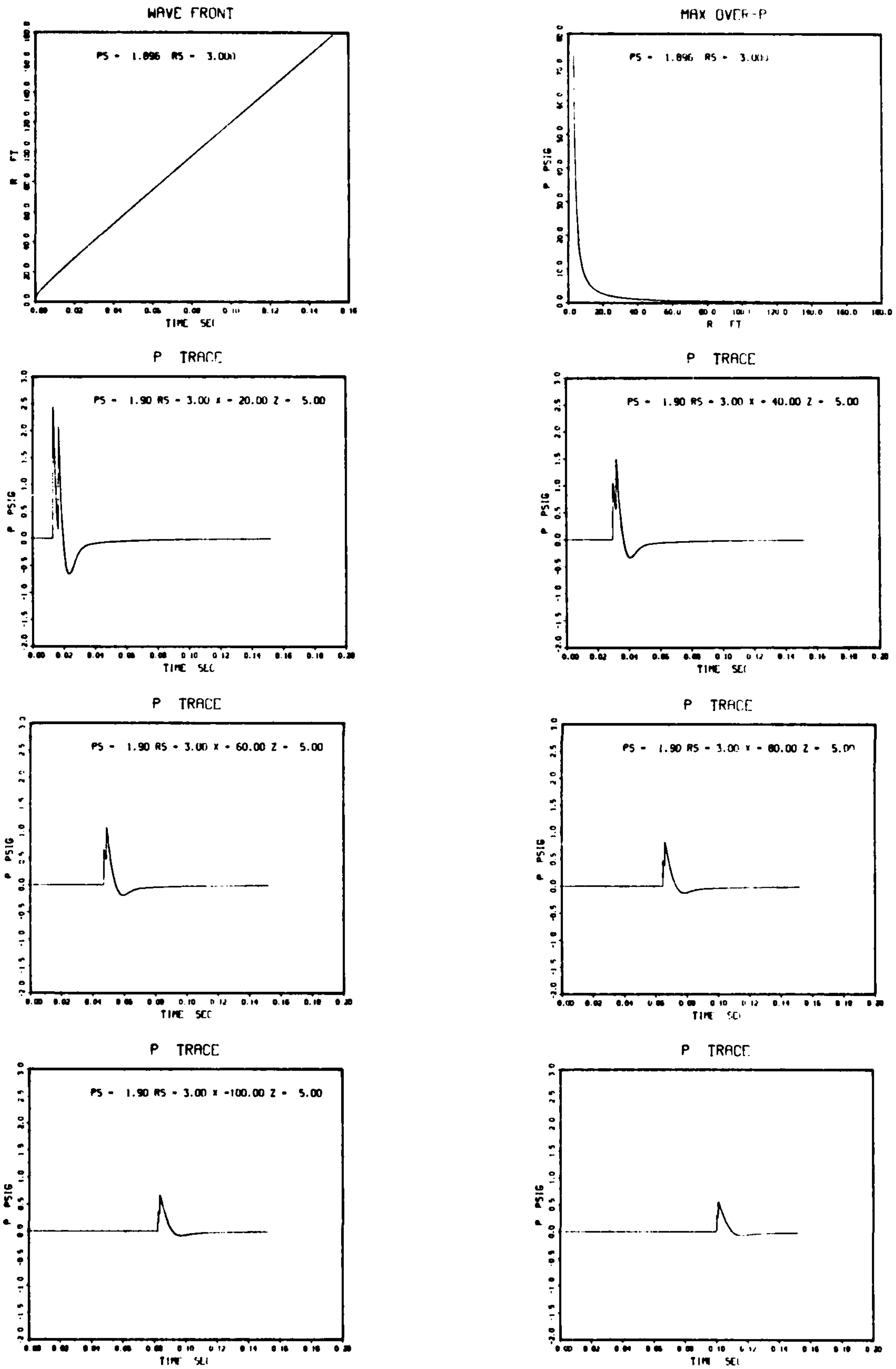
Figure 23(a)



Source Height = 10 feet

$P_o = 1.14$

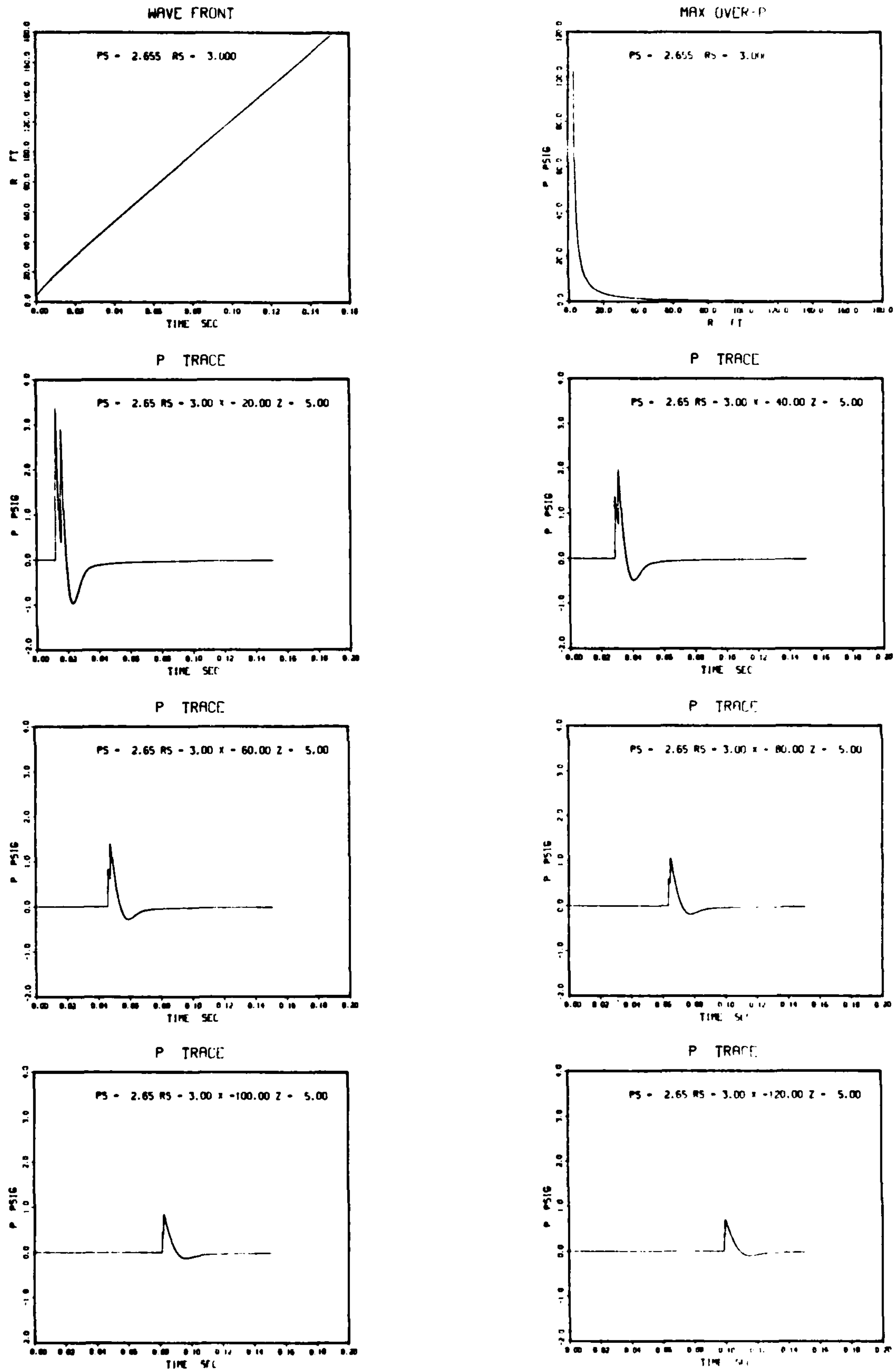
Figure 23(b)



Source Height = 10 feet

P_o = 1.90

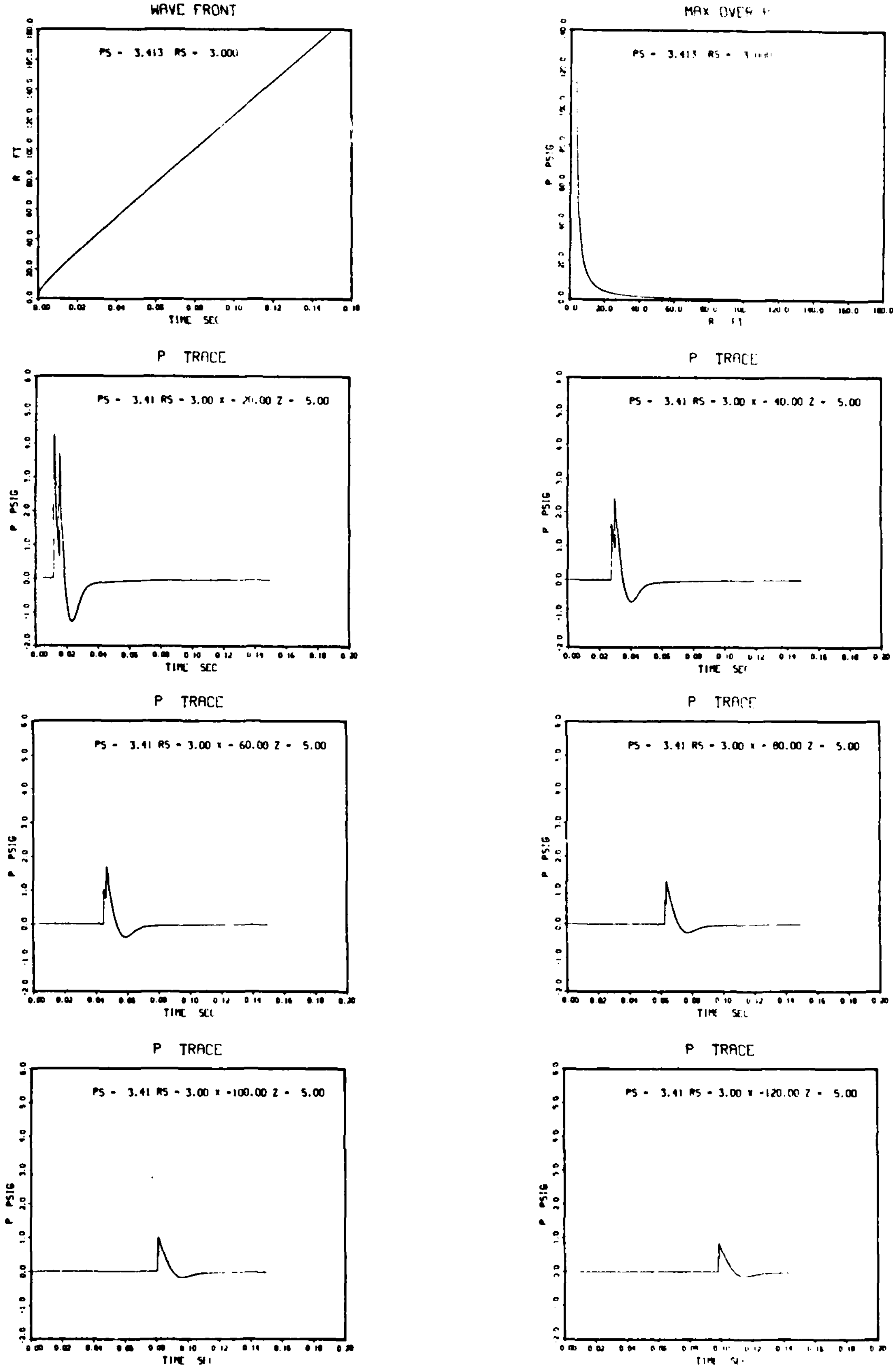
Figure 23(c)



Source Height = 10 feet

P_o = 2.65

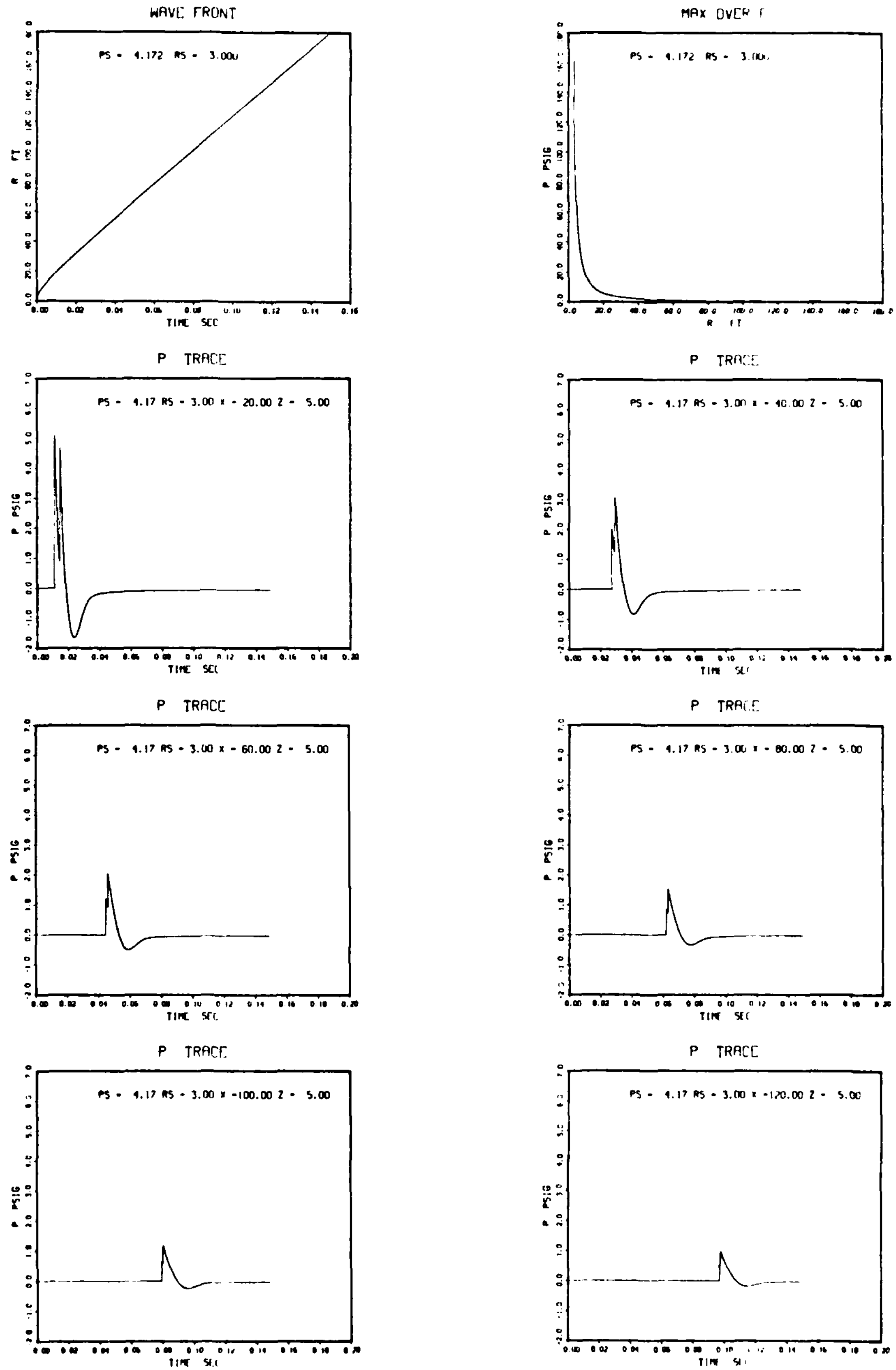
Figure 23(d)



Source Height = 10 feet

$P_o = 3.41$

Figure 23(e)



Source Height = 10 feet

P_o = 4.17
Figure 23(f)

Table 7.
(H = 15 ft)

r (ft)	P_s (atm) 2	4	6	8	10	12
	a. Maximum Static Overpressure (psi)					
10	1.41*	2.94*	4.31*	5.65*	7.31*	9.47*
20	0.85	1.64*	2.30*	2.94*	3.69	4.60
30	0.55	1.03	1.43	1.87	2.39	3.00
40	0.48	0.90	1.24	1.64	2.11	2.55
50	0.44	0.80	1.11	1.48	1.84	2.18
60	0.41	0.72	0.98	1.28	1.56	1.88
70	0.37	0.65	0.87	1.12	1.35	1.65
80	0.34	0.59	0.78	0.98	1.21	1.42
90	0.31	0.53	0.71	0.89	1.08	1.29
100	0.28	0.48	0.64	0.79	0.96	1.14
110	0.26	0.44	0.59	0.74	0.89	1.04
120	0.24	0.41	0.54	0.67	0.81	0.96
	b. A-Impulse (psi-ms)					
10	1.53*	3.49*	5.41*	7.26*	9.64*	12.72*
20	1.24*	2.54*	3.83*	5.13*	10.82	14.17
30	1.69	3.39	5.06	6.85	9.13	12.01
40	1.62	3.00	4.38	6.04	7.91	9.97
50	1.47	2.68	3.87	5.29	6.91	8.67
60	1.41	2.46	3.44	4.69	5.98	7.53
70	1.29	2.31	3.15	4.18	5.36	6.79
80	1.22	2.19	2.92	3.81	4.90	5.99
90	1.15	2.02	2.72	3.57	4.52	5.56
100	1.10	1.91	2.58	3.27	4.10	5.09
110	1.04	1.82	2.44	3.11	3.93	4.82
120	1.02	1.76	2.33	2.95	3.68	4.47
	c. A-Duration (ms)					
10	2.63*	2.95*	3.24*	3.43*	3.62*	3.83*
20	3.49*	3.73*	4.07*	4.33*	7.94	8.16
30	7.21	7.12	7.28	7.45	9.76	8.13
40	7.22	7.06	7.32	7.60	7.87	8.21
50	7.38	7.28	7.47	7.68	8.05	8.50
60	7.78	7.59	7.69	7.98	8.29	8.69
70	8.11	8.00	8.02	8.24	8.65	9.00
80	8.52	8.50	8.45	8.59	8.94	9.24
90	8.96	8.88	8.76	8.99	9.28	9.54
100	9.41	9.29	9.27	9.28	9.51	9.88
110	9.87	9.72	9.65	9.60	9.93	10.24
120	10.33	10.16	10.04	10.09	10.22	10.49

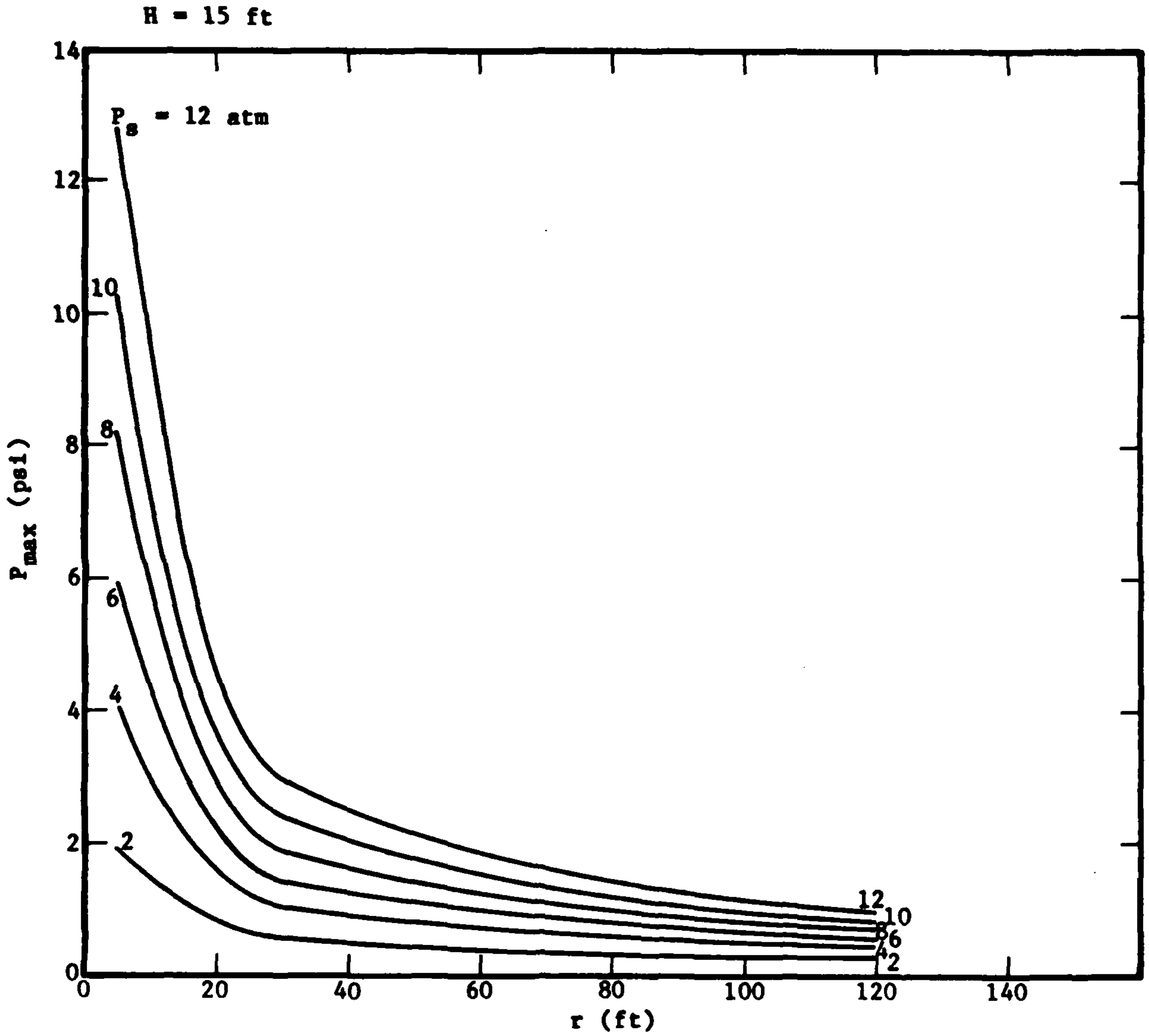
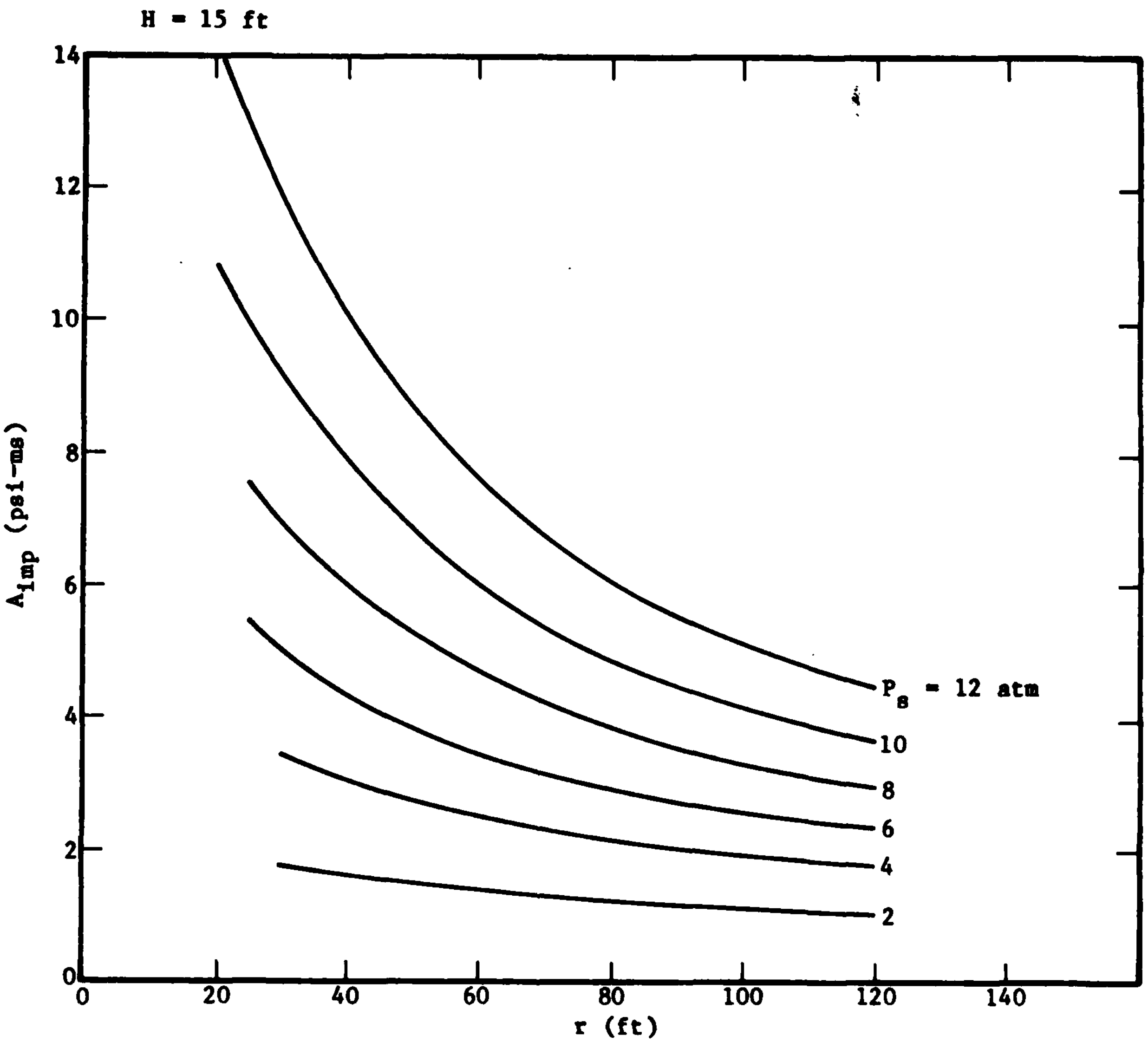
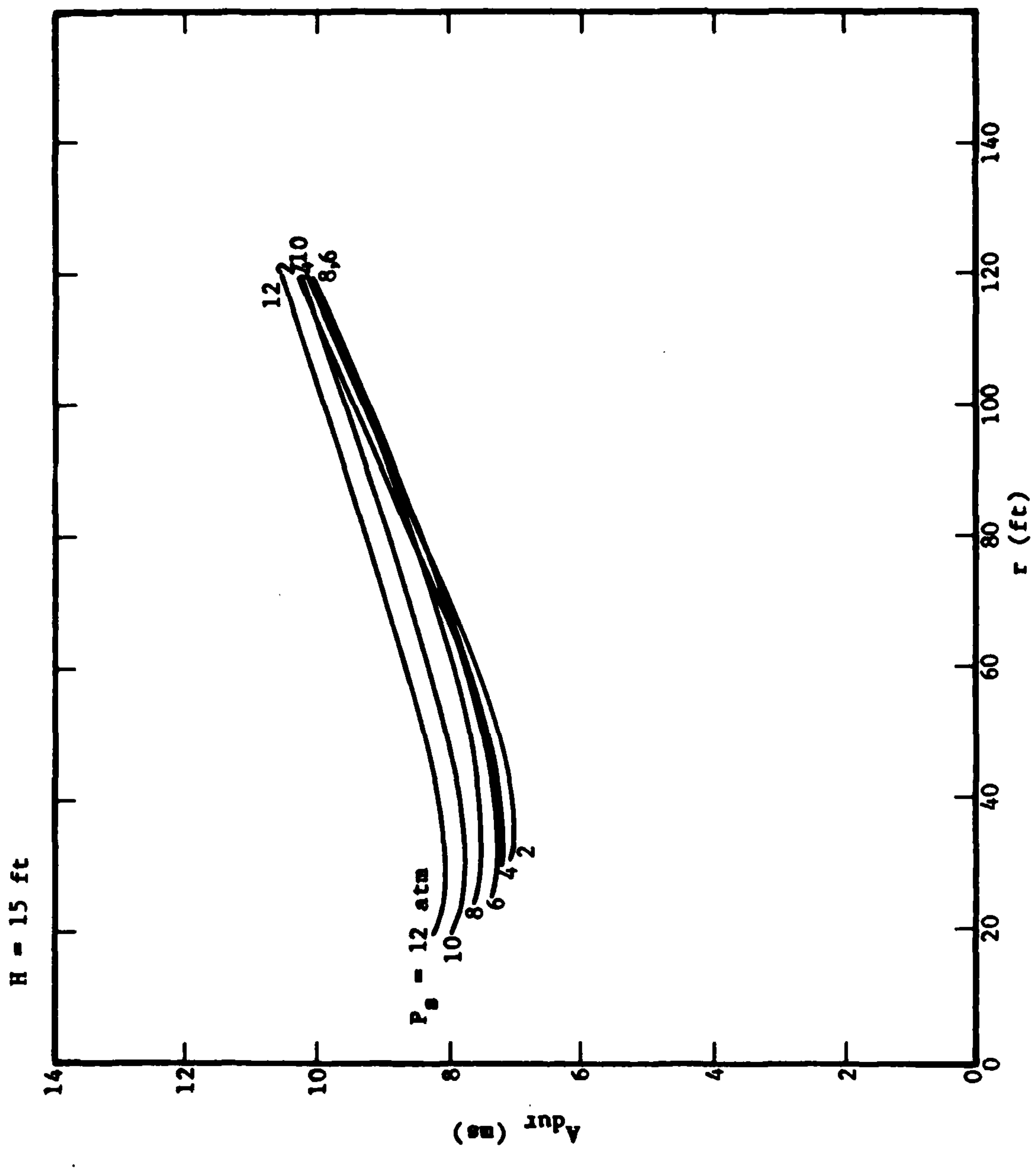

H = 15 ft
P_s = 12 atm
10
8
6
4
2
12
10
8
6
4
2
P_{max} (psi)
r (ft)
0
20
40
60
80
100
120
140
2
4
6
8
10
12
14

Figure 24(a)



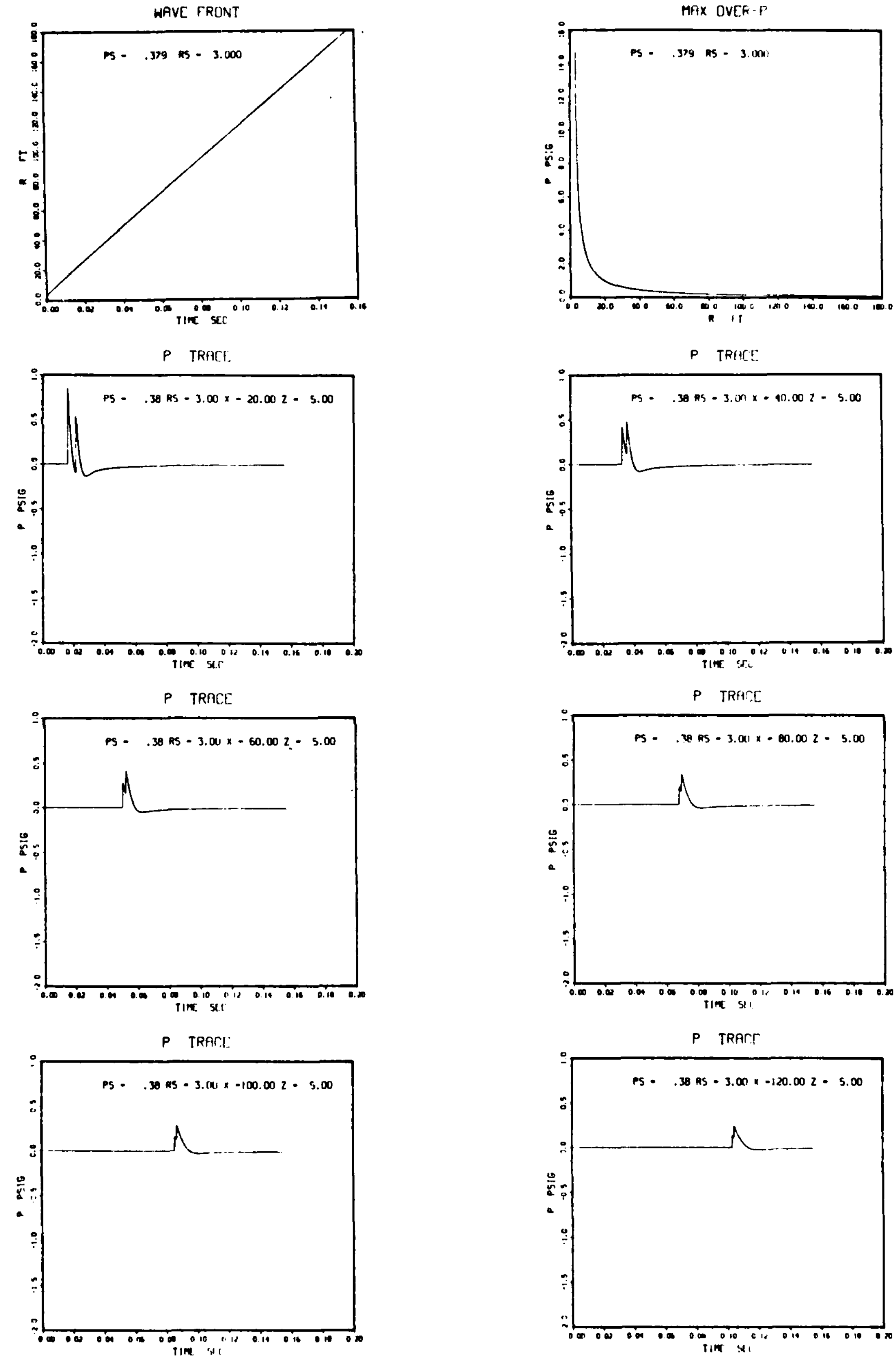
H = 15 ft
A_{imp} (psi-ms)
r (ft)
P_s = 12 atm
10
8
6
4
2
0
20
40
60
80
100
120
140
12
14

Figure 24(b)



H = 15 ft
P_s = 12 atm
10
8
6
4
2
12
10
8,6
A_dur (ms)
r (ft)
0
2
4
6
8
10
12
14
20
40
60
80
100
120
140

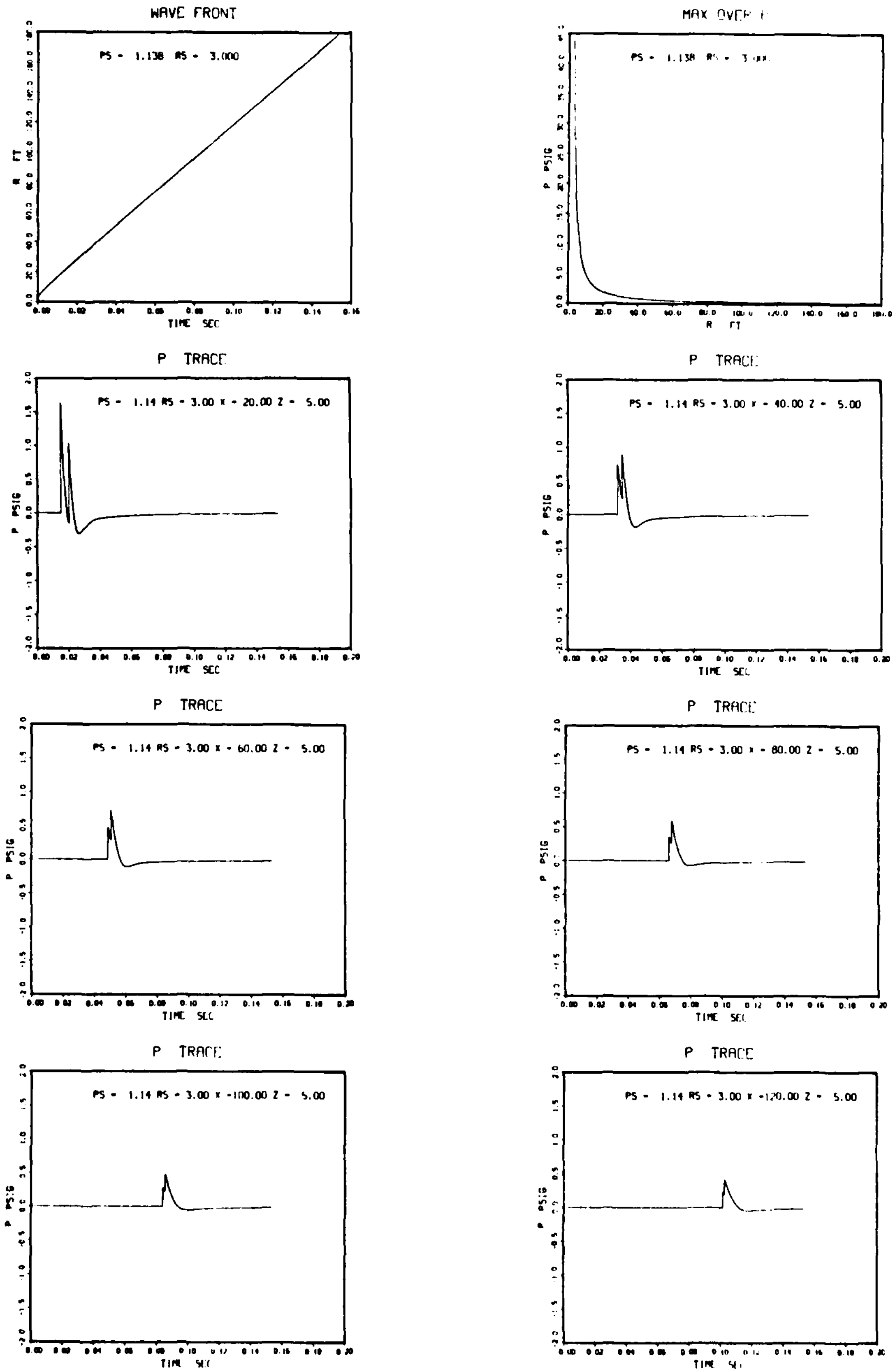
Figure 24(c)



Source Height = 15 feet

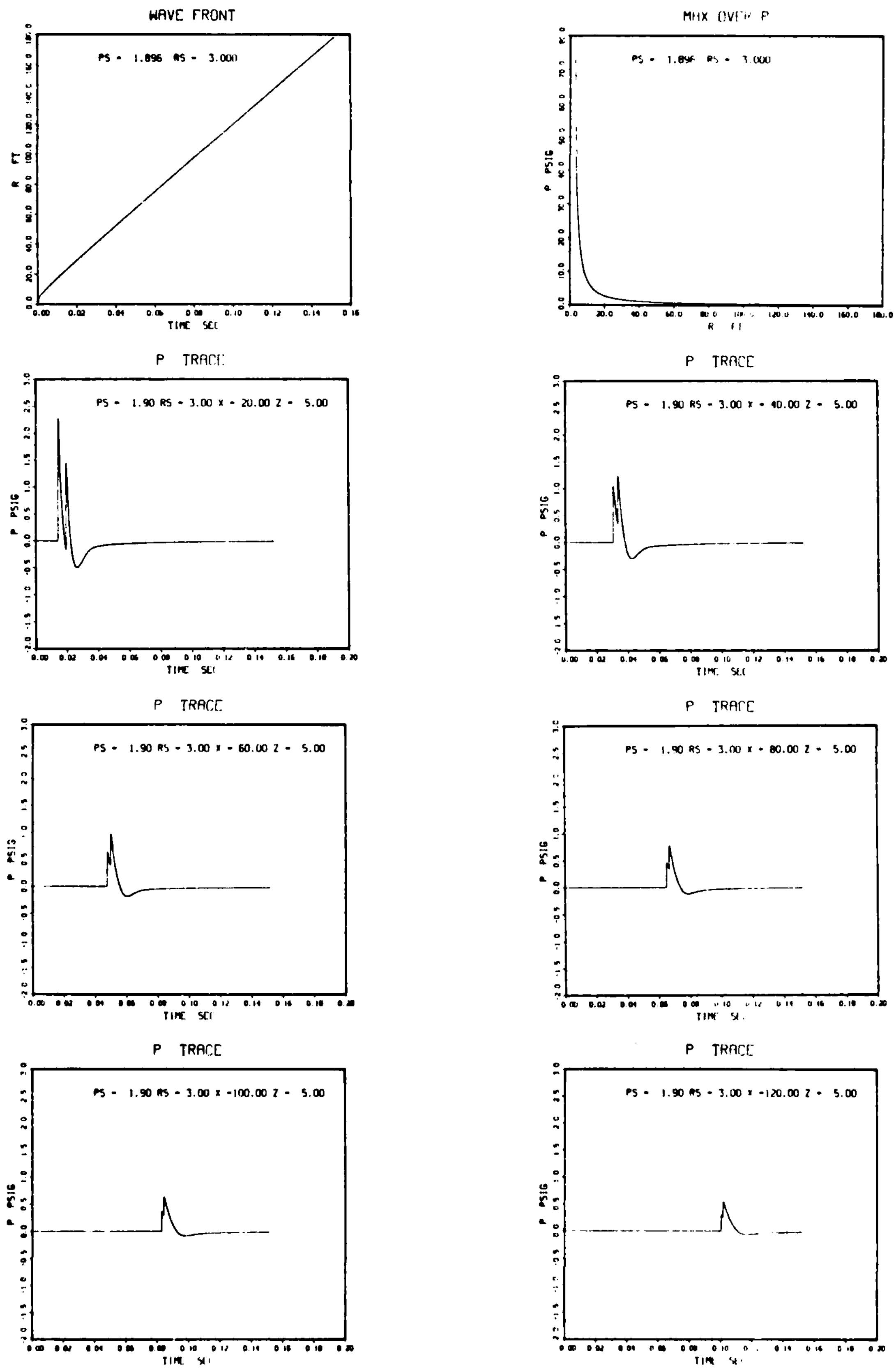
$P_o = 0.38$

Figure 25(a)



Source Height = 15 feet

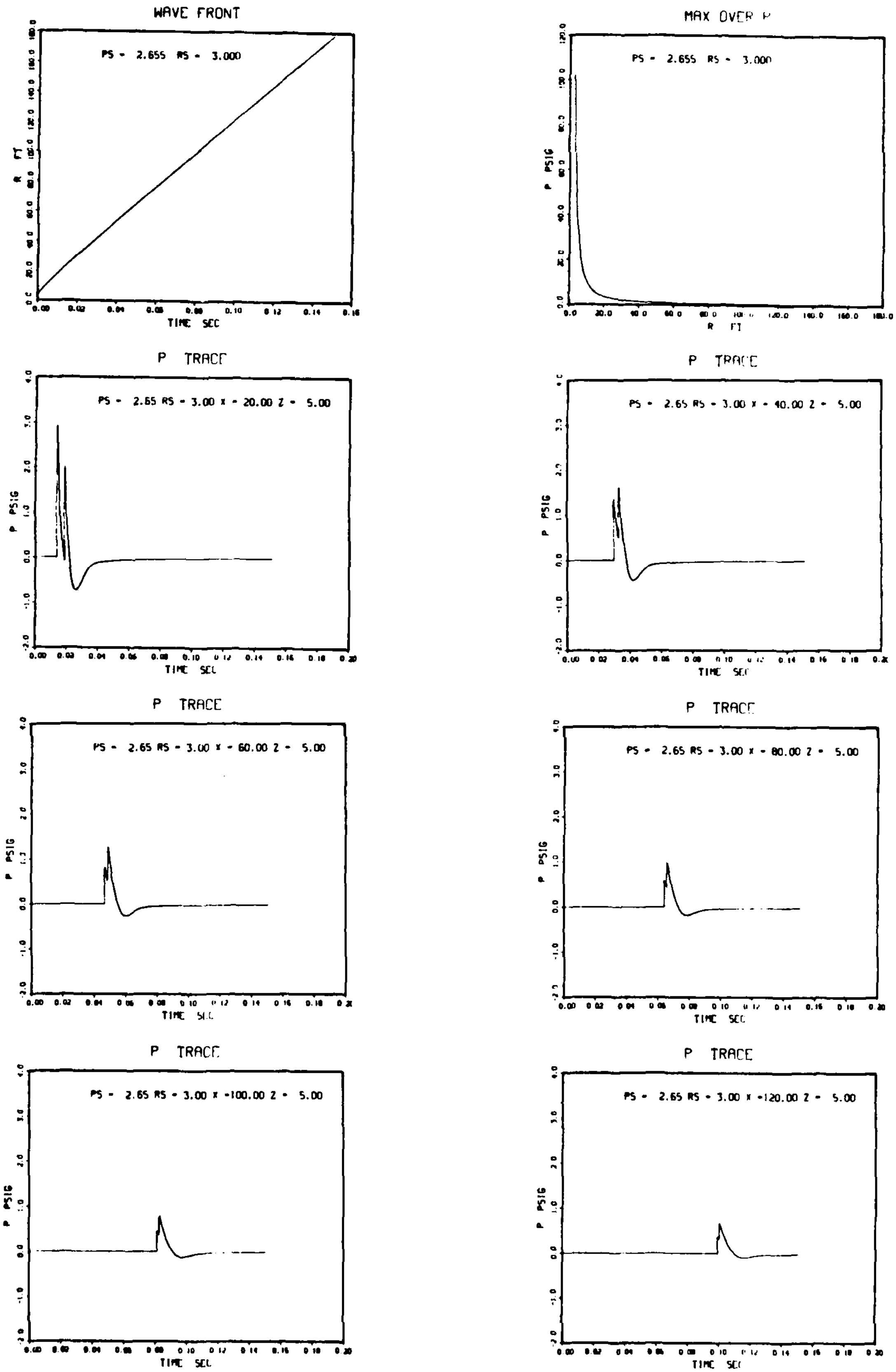
$P_{o'}$ = 1.14
Figure 25(b)



Source Height = 15 feet

P_o = 1.90

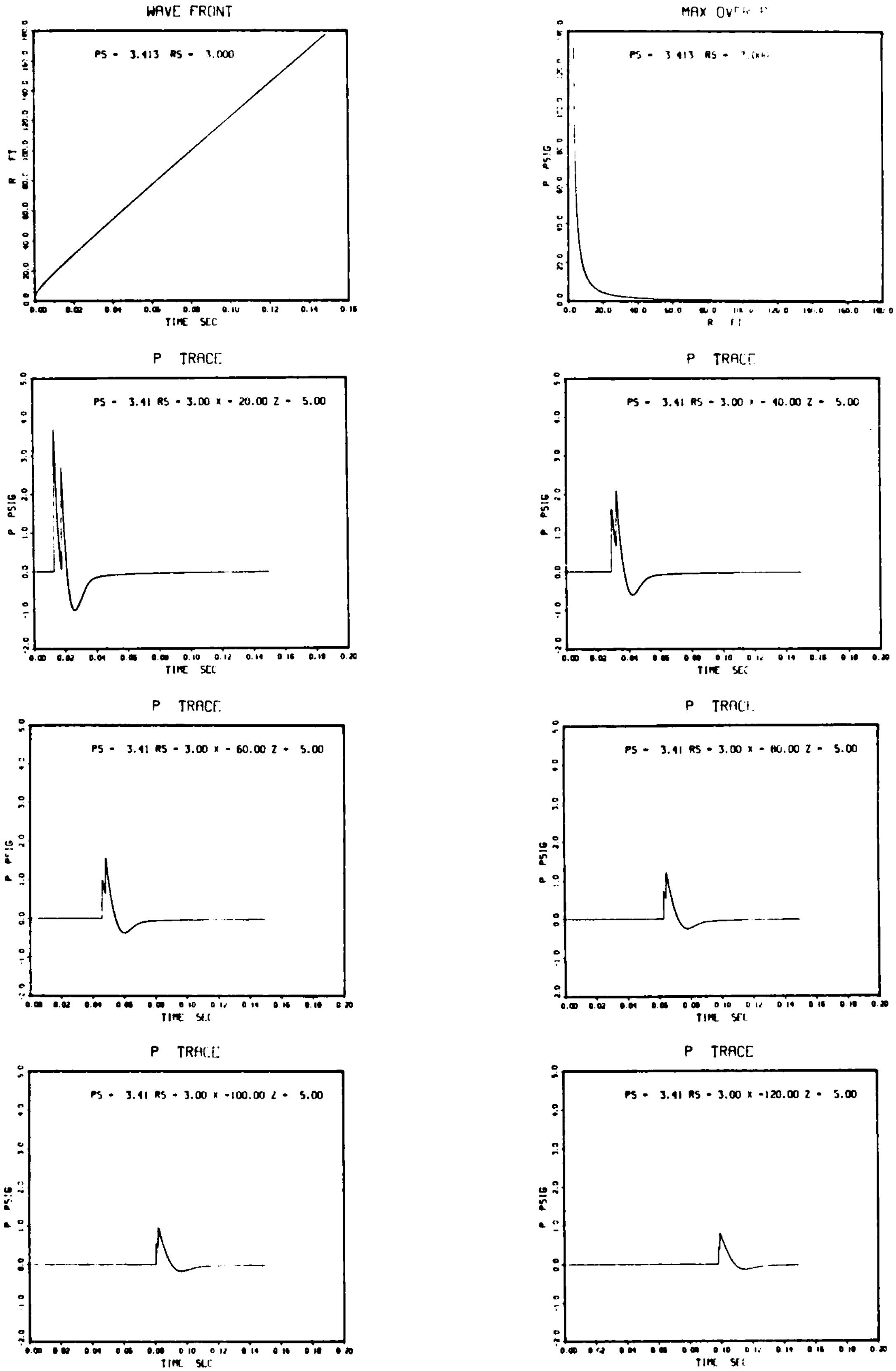
Figure 25(c)



Source Height = 15 feet

P_o = 2.65

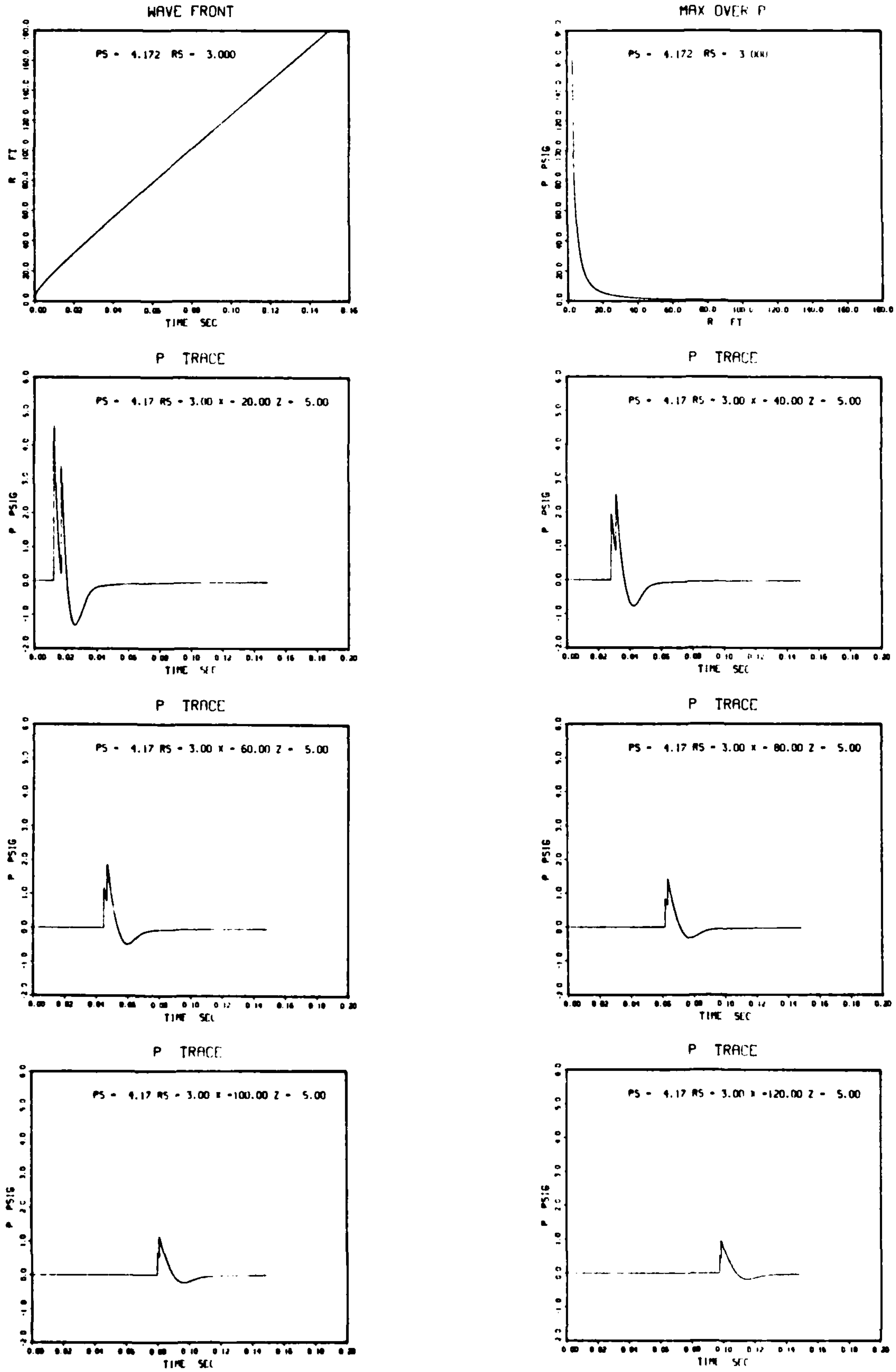
Figure 25(d)



Source Height = 15 feet

$P_o = 3.41$

Figure 25(e)



Source Height = 15 feet

P_o = 4.17

Figure 25(f)

Table 8.
(H = 20 ft)

r (ft)	P_s (atm) 2	4	6	8	10	12
			a. Maximum Static Overpressure (psi)			
10	1.09*	2.08*	3.07*	4.09*	5.01*	6.56*
20	0.72*	1.43*	1.97*	2.61*	3.22*	3.93*
30	0.52*	0.96*	1.33	1.77	2.19	2.57
40	0.42	0.78	1.06	1.40	1.80	2.19
50	0.39	0.70	0.97	1.30	1.63	1.93
60	0.36	0.66	0.89	1.17	1.43	1.72
70	0.34	0.60	0.80	1.03	1.29	1.53
80	0.32	0.55	0.73	0.92	1.13	1.37
90	0.29	0.50	0.63	0.84	1.03	1.20
100	0.27	0.46	0.60	0.77	0.93	1.10
110	0.24	0.42	0.56	0.71	0.85	1.01
120	0.23	0.39	0.52	0.65	0.78	0.91
			b. A-Impulse (psi-ms)			
10	1.38*	2.80*	4.49*	6.33*	7.96*	10.90*
20	1.09*	2.37*	3.47*	4.93*	6.36*	8.13*
30	0.94*	1.82*	4.48	6.47	8.54	10.76
40	1.56	2.95	4.11	5.62	7.34	9.51
50	1.44	2.60	3.73	5.07	6.61	8.30
60	1.36	2.43	3.37	4.58	5.83	7.33
70	1.28	2.29	3.10	4.11	5.38	6.65
80	1.22	2.14	2.85	3.80	4.77	6.07
90	1.15	2.02	2.71	3.54	4.48	5.41
100	1.10	1.90	2.52	3.32	4.07	5.05
110	1.04	1.82	2.44	3.11	3.84	4.72
120	1.00	1.74	2.30	2.96	3.62	4.41
			c. A-Duration (ms)			
10	3.05*	3.27*	3.66*	3.97*	4.16*	4.51*
20	3.65*	3.97*	4.26*	4.64*	4.94*	5.26*
30	4.36*	4.50*	8.22	8.45	8.68	8.85
40	8.08	7.98	8.01	8.23	8.45	8.91
50	8.11	7.95	8.08	8.25	8.59	9.01
60	8.35	8.12	8.18	8.44	8.73	9.11
70	8.62	8.48	8.48	8.67	9.06	9.40
80	9.01	8.82	8.75	9.03	9.21	9.65
90	9.32	9.23	9.10	9.31	9.59	9.84
100	9.82	9.55	9.50	9.66	9.74	10.09
110	10.19	10.04	9.96	9.90	10.07	10.38
120	10.59	10.42	10.29	10.33	10.45	10.71

H = 20 ft

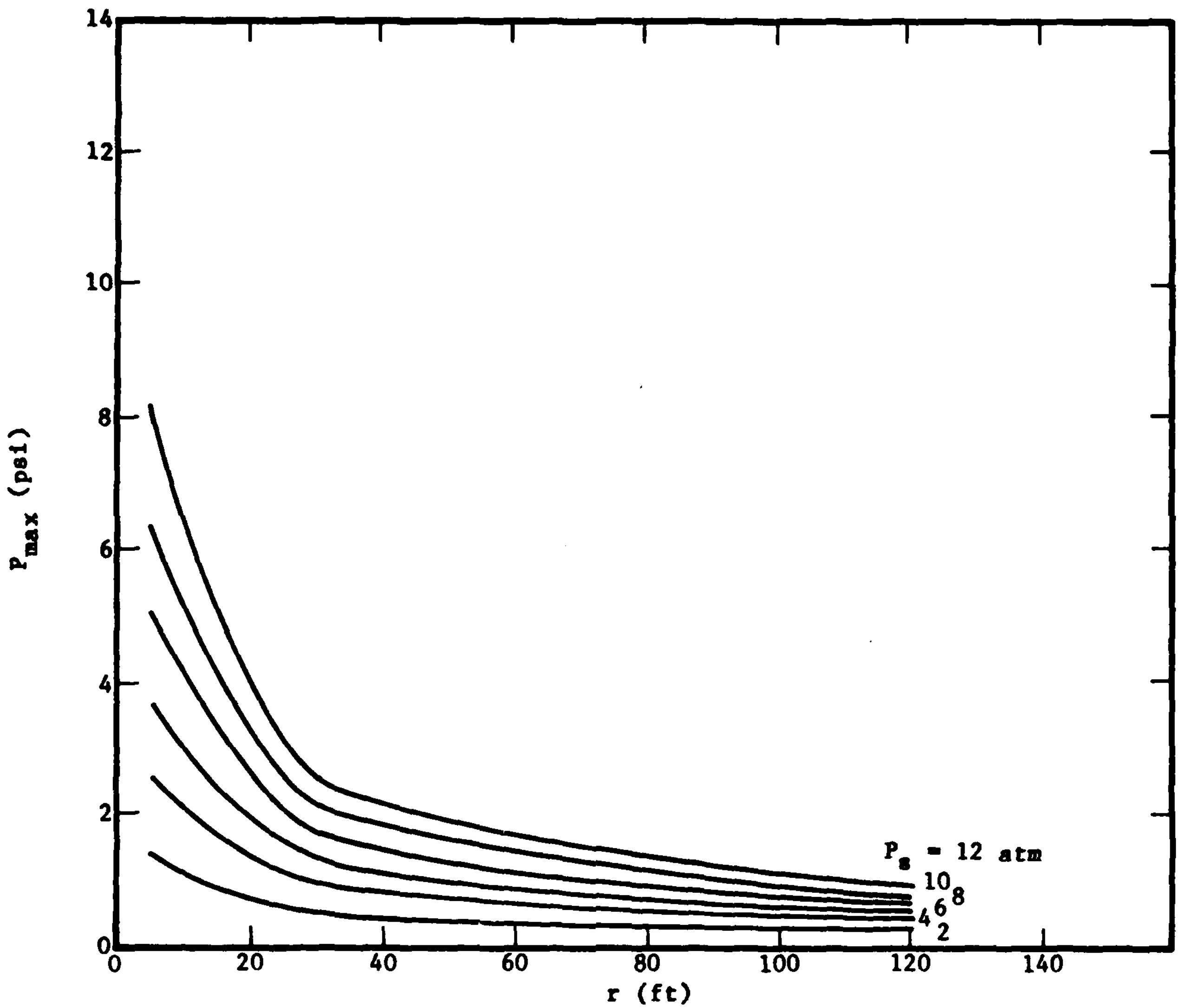


Figure 26(a)

H = 20 ft

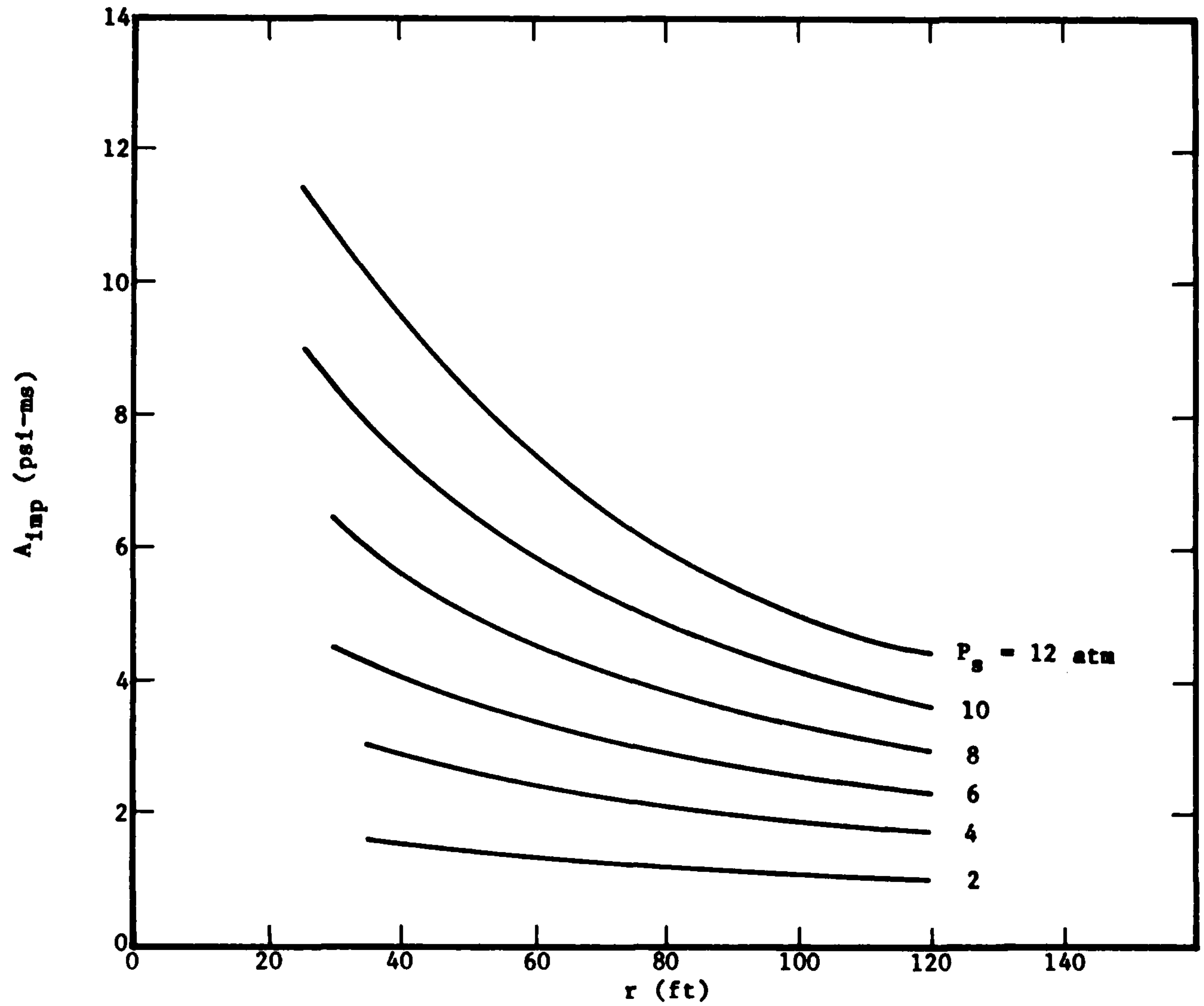


Figure 26(b)

$H = 20$ ft

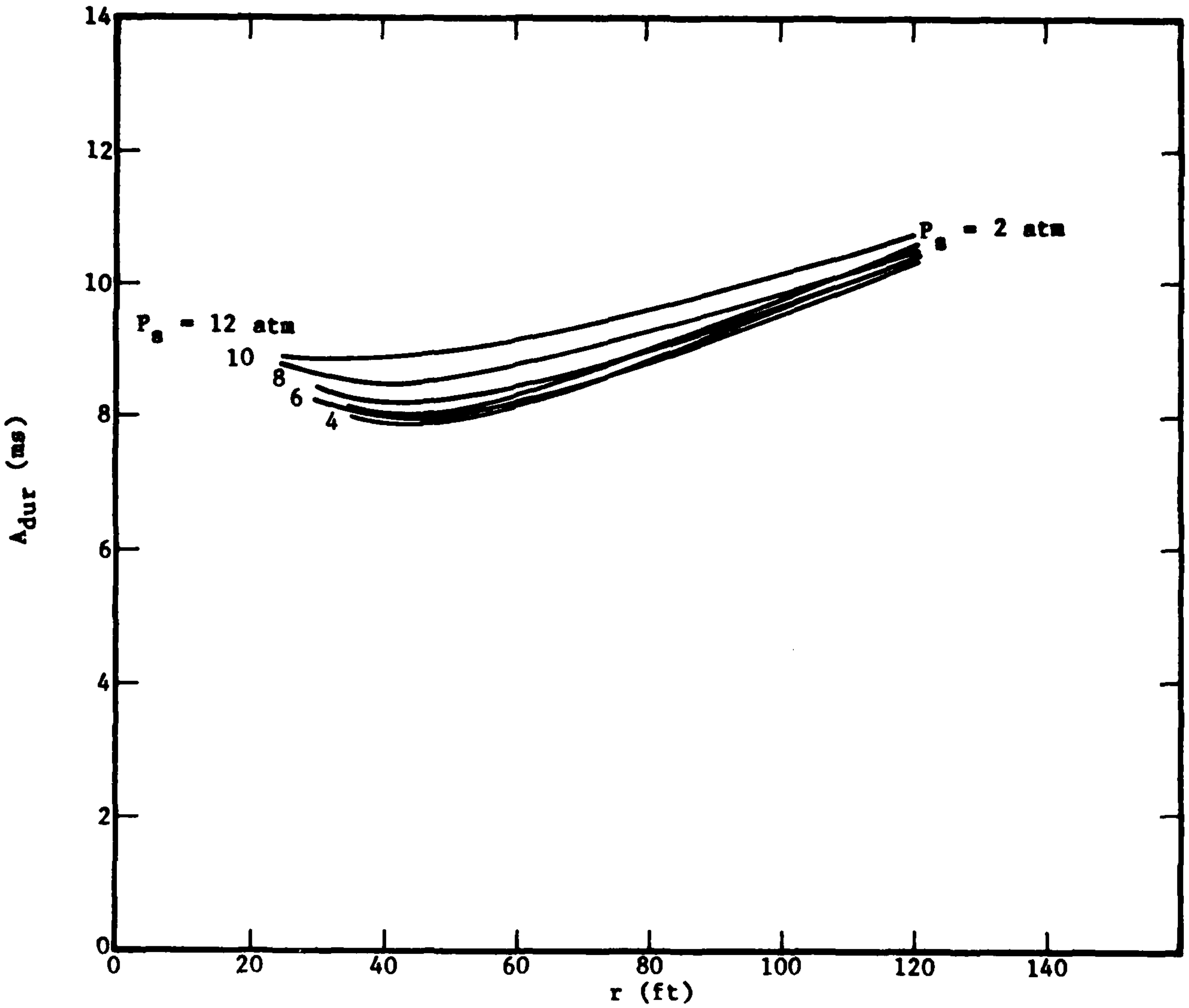
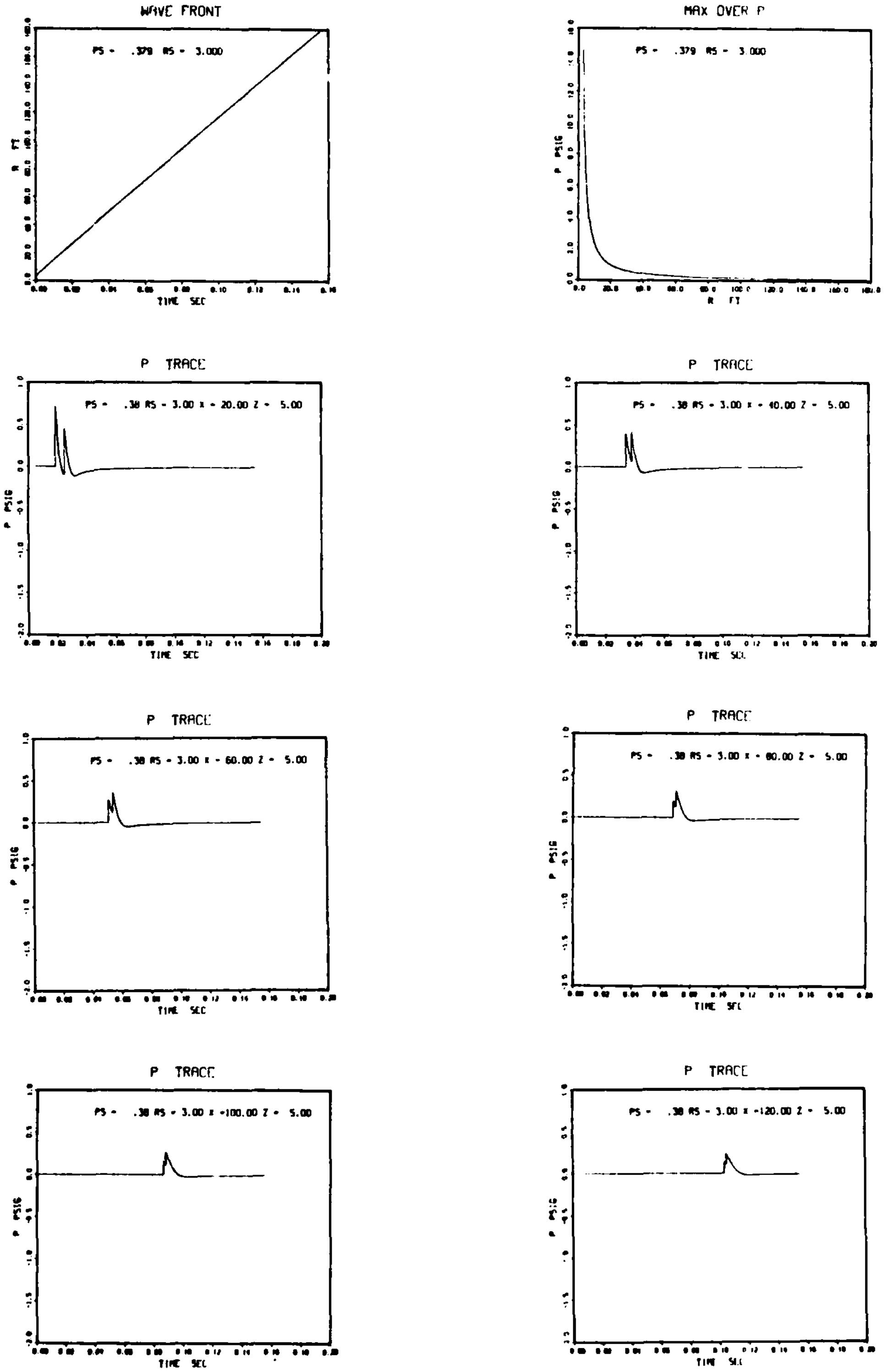


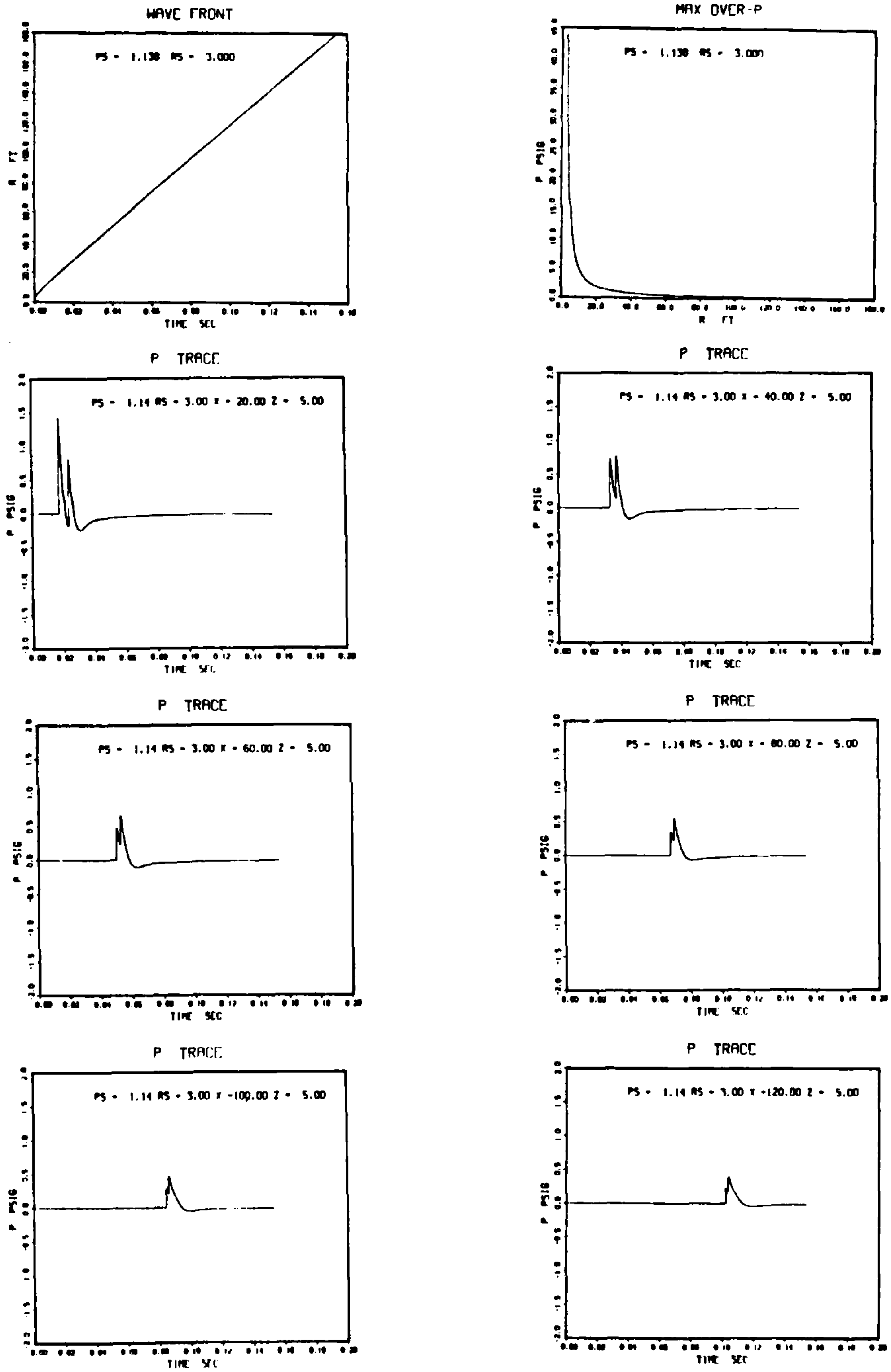
Figure 26(c)



Source Height = 20 ft

P_o = 0.38

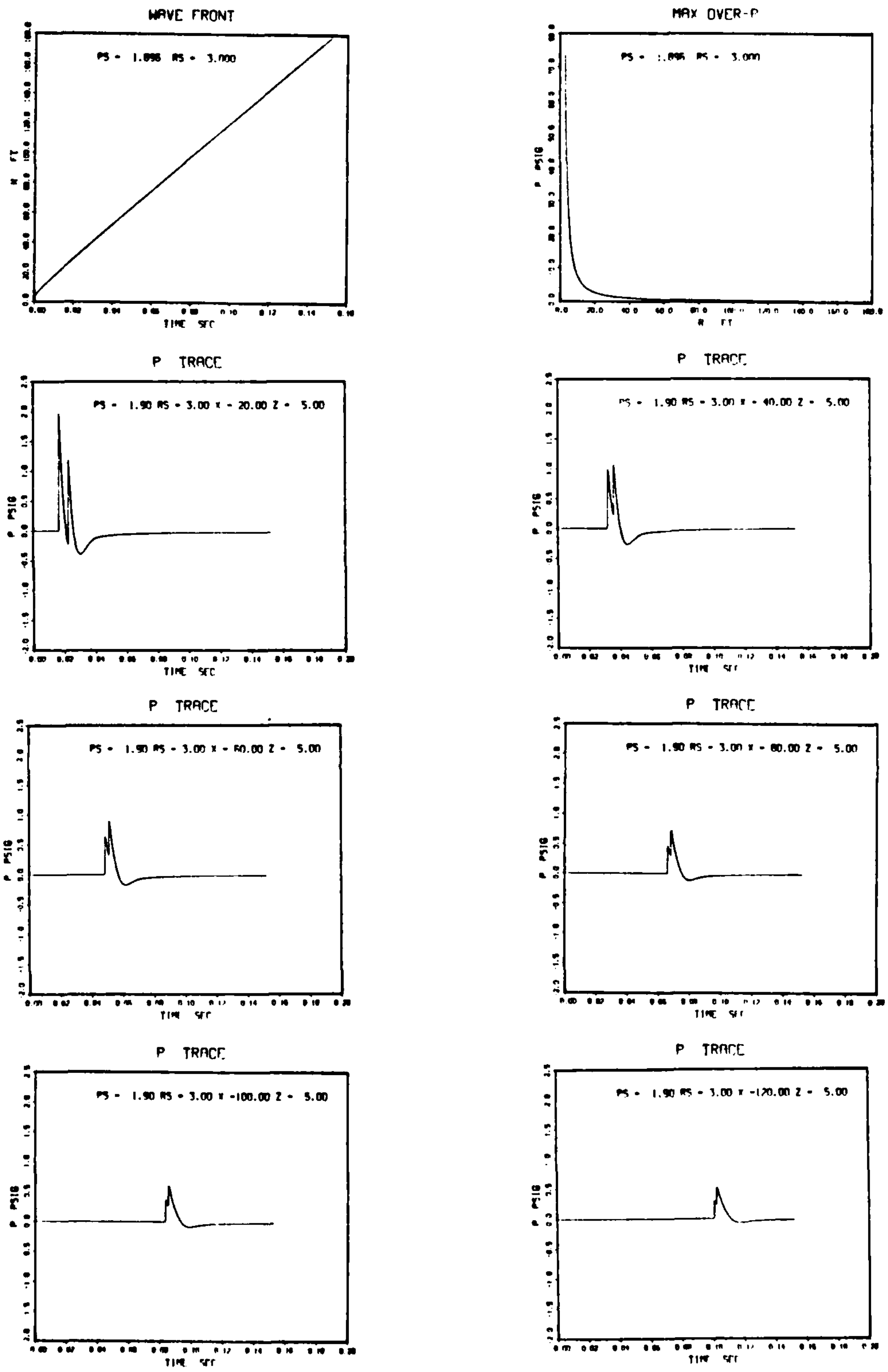
Figure 27(a)



Source Height = 20 ft

P_o = 1.14

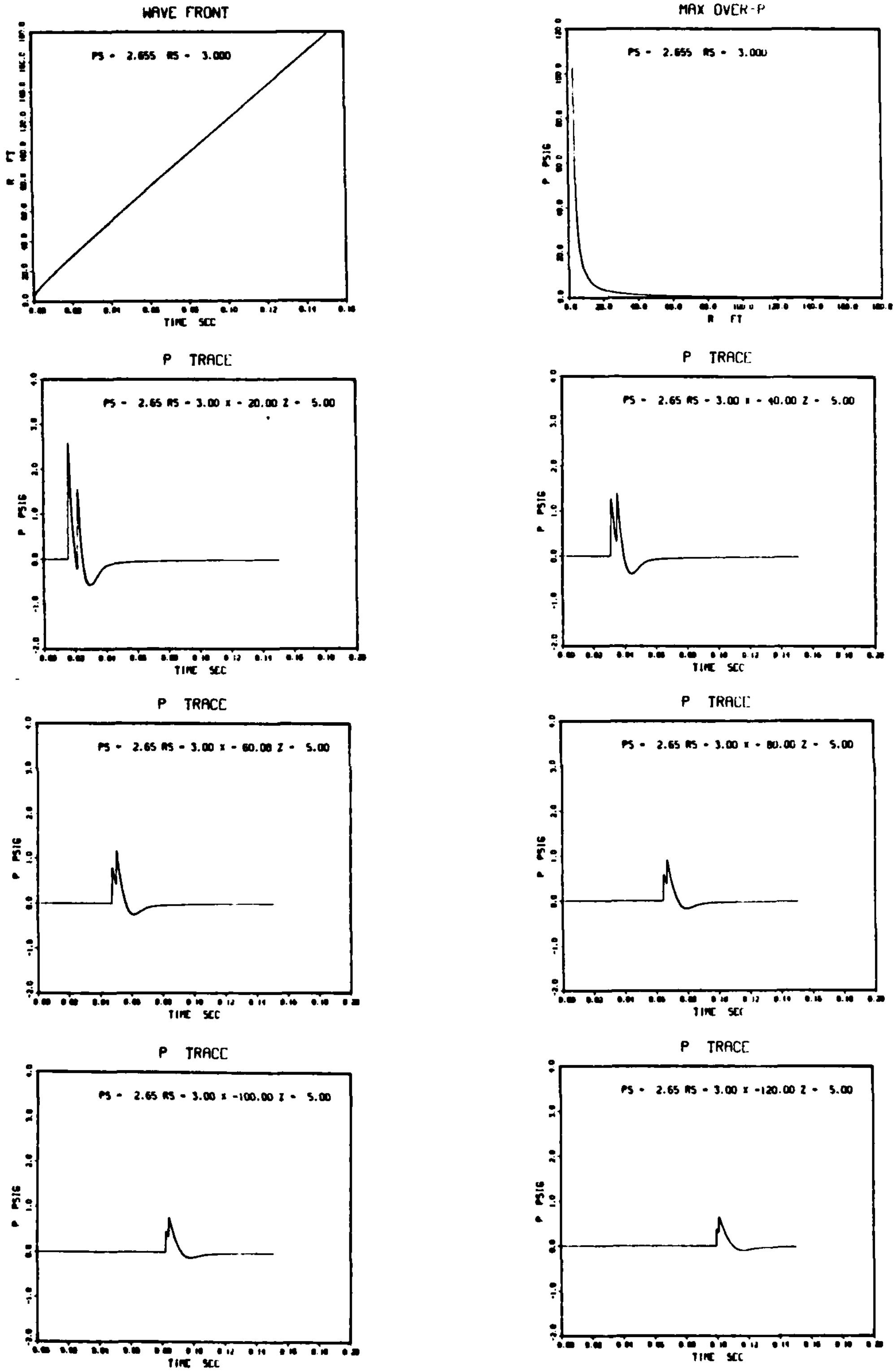
Figure 27(b)



Source Height = 20 ft

P_o = 1.90

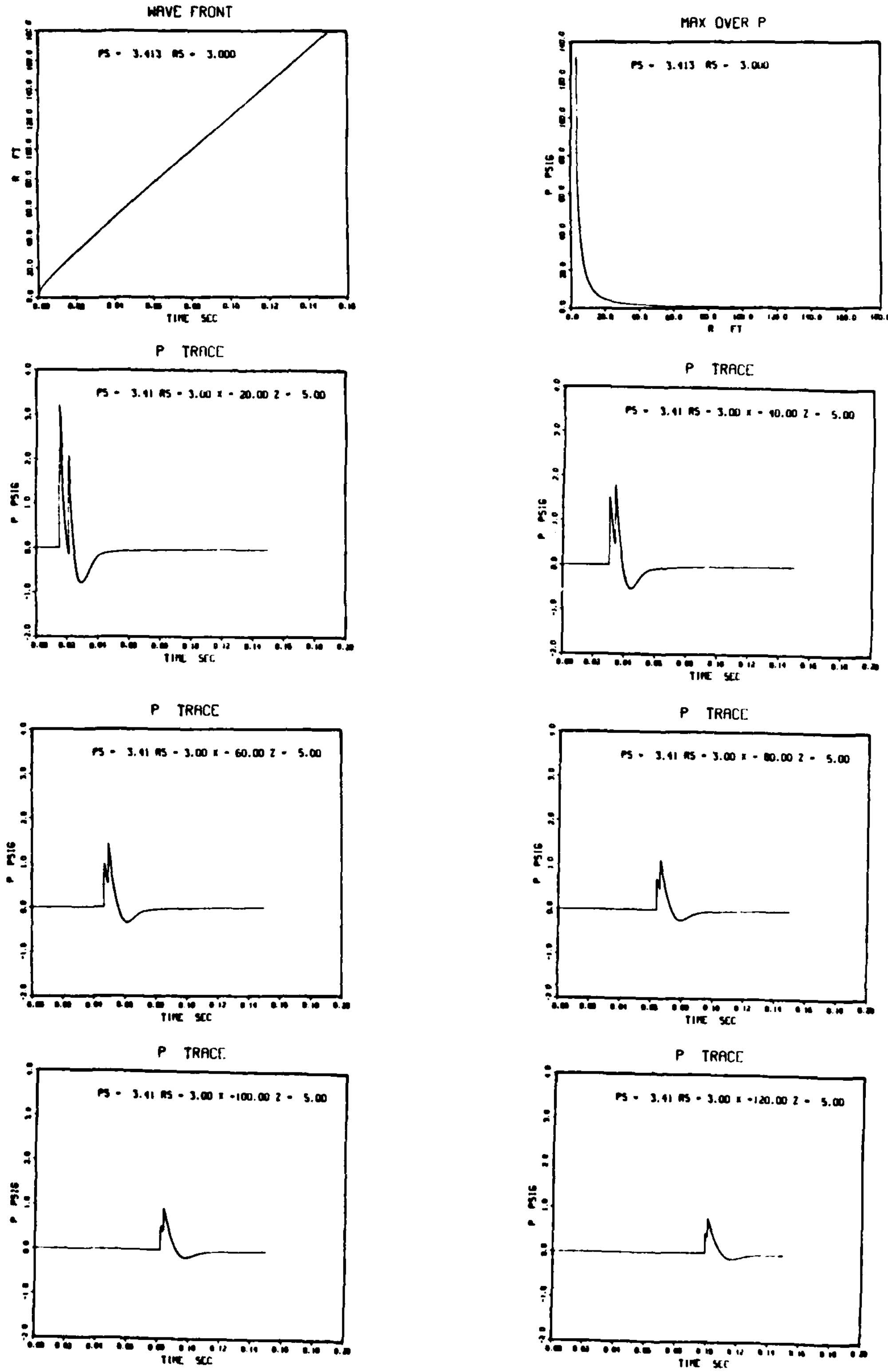
Figure 27(c)



Source Height = 20 ft

P_o = 2.65

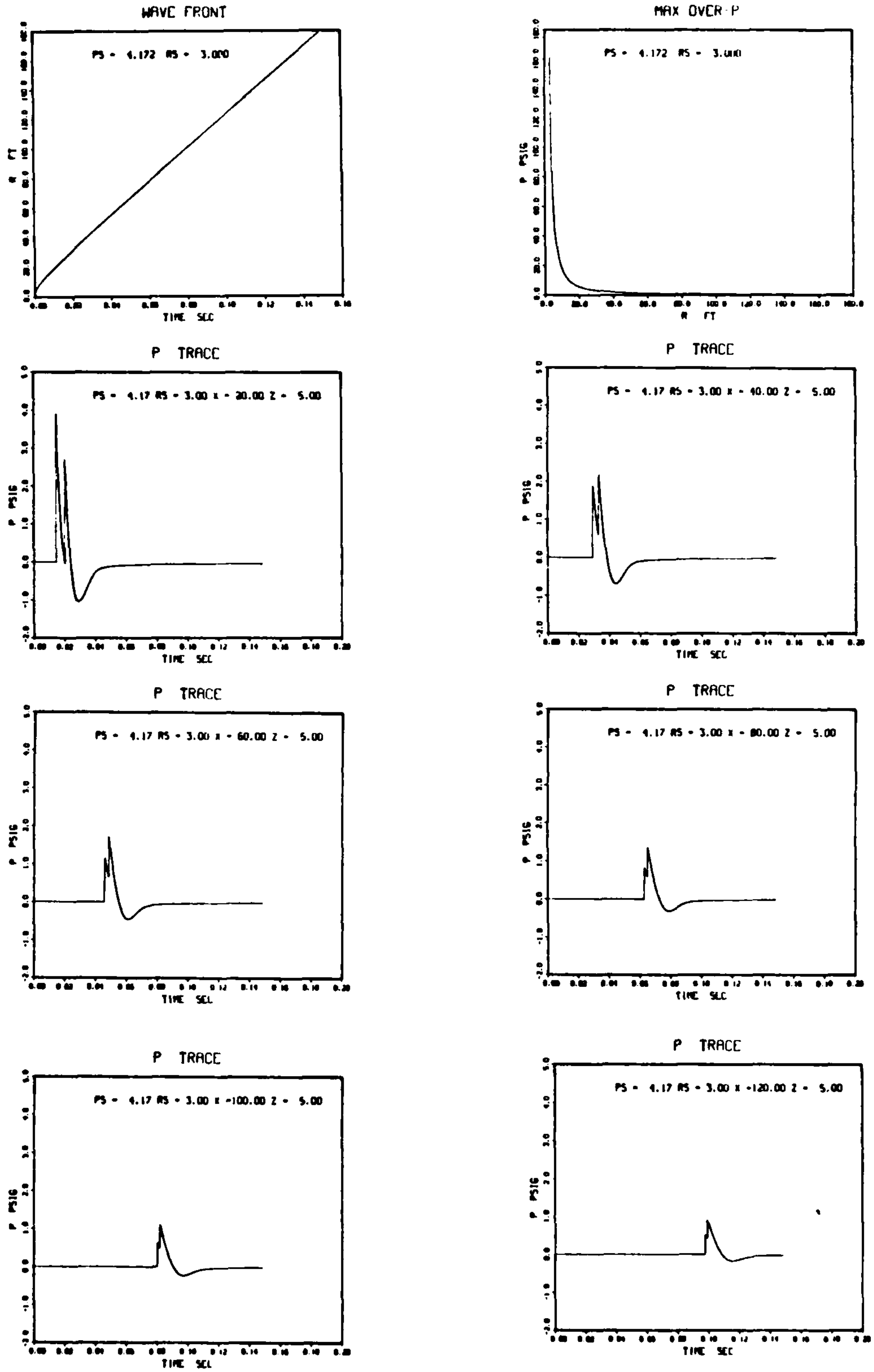
Figure 27(d)



Source Height = 20 ft

$P_o = 3.41$

Figure 27(e)



Source Height = 20 ft

P_o = 4.17

Figure 27(f)

3. BLAST LOADING ON TWO-DIMENSIONAL BODIES

3.1 CALCULATION OF GAS DYNAMICS ABOUT IDEALIZED BODY SHAPES

The coupling between the blast field and the body response hinges critically on the forces induced on the body as the blast wave passes by. These forces are not constant around the body because of sheltering effects due to the gas dynamic flow. It is important to any model describing the motion of the body to be able to describe the magnitude and timing of the loading on different parts for various strength and orientations of the blast waves. In this section results are presented that quantify these forces for use in body dynamic calculations.

The calculations were originally intended to be compared with experimental data taken at Lovelace Research Institute, but because of the inability of Lovelace to schedule tests during the period of performance of the contract, only the calculations are presented at this time. However, we have conducted more calculations than originally called out in order to give a broader view of the possible loading distributions.

In the accompanying figures, the transient loading of the body due to gas dynamics is presented for three different body shapes, a square, a circle, and a two-to-one ellipse for two strengths of blast waves, 3 and 20 psi, and for two orientations of the ellipse, normal and 45° rotation. For each geometric configuration and strength of blast wave, results are presented for the pressure contours in the air and about the body, the velocity vector field of the flow generated by the passage of the blast wave, and the time-dependent load distribution on the body. The results are self explanatory and will be described in generic terms.

In each instance, the incoming blast wave (indicated by the bunching of pressure contour lines around the maximum) propagates toward the body, diffracts around the body, and creates a bow shockwave off the front of the body that rebounds toward the incident direction. The nature of the orientation of the body strongly affects the magnitude of the reflected pulse, extreme examples are between the ellipse at 45° and at normal direction. At normal

direction there is greater frontal area blocking the wave and much more intense loading produced. The load distribution seen with each geometric configuration clearly points out the strong variation with position and time that occurs for each body. In general, the front-facing part, which is designated by $\theta = -90°$, receives the largest impulse and is also the first to receive the blast wave. Approximately 2 to 3 msec later, the time required for the blast to diffract around the body, the back feels a lesser intensity loading. The sides tend to see an intermediate value close to the incident wave strength, but one that changes considerably with geometry.

The shock multiplying effect is also seen in the data. The lower level 3 psi waves produce maximum frontal loadings between 5 and 6 psi whereas the 20 psi waves produce frontal loadings as large as 70 to 90 psi. This amplification is known in strong shock wave theory and is accurately reproduced in these calculations.

The distributions presented here when validated by experimental comparison, offer an important link in being able to describe the body dynamics. The calculational tool used is JAYCOR's EITACC Code which is capable of describing arbitrary geometries, highly compressible flow, and uses a boundary condition treatment with maximum resolution and yet allowing waves to propagate out of computational mesh.

3.2 PROTOCOL FOR VERIFICATION TESTS AT LOVELACE INHALATION AND TOXICOLOGY RESEARCH INSTITUTE (ITRI)

This section contains a "Protocol for Exposing a Model of the Upper Torso to Shock Waves." The protocol was prepared by JAYCOR after informal discussions with scientists at WRAIR and at Lovelace ITRI. At the time of this report preparation, testing of such a model has been delayed due to other and higher priority tests. However, the basic objective and derived methodology for the testing is still valid. As a natural adjunct to the calculation of gas dynamics about idealized body shapes described in Section 3.1, the protocol should achieve the stated objectives. It is expected that there may be some minor changes to the protocol before testing is initiated. For instance, the number of transducers to gather information on the shock waves, the size of transducers, method of shock wave promulgation, and others. These final test

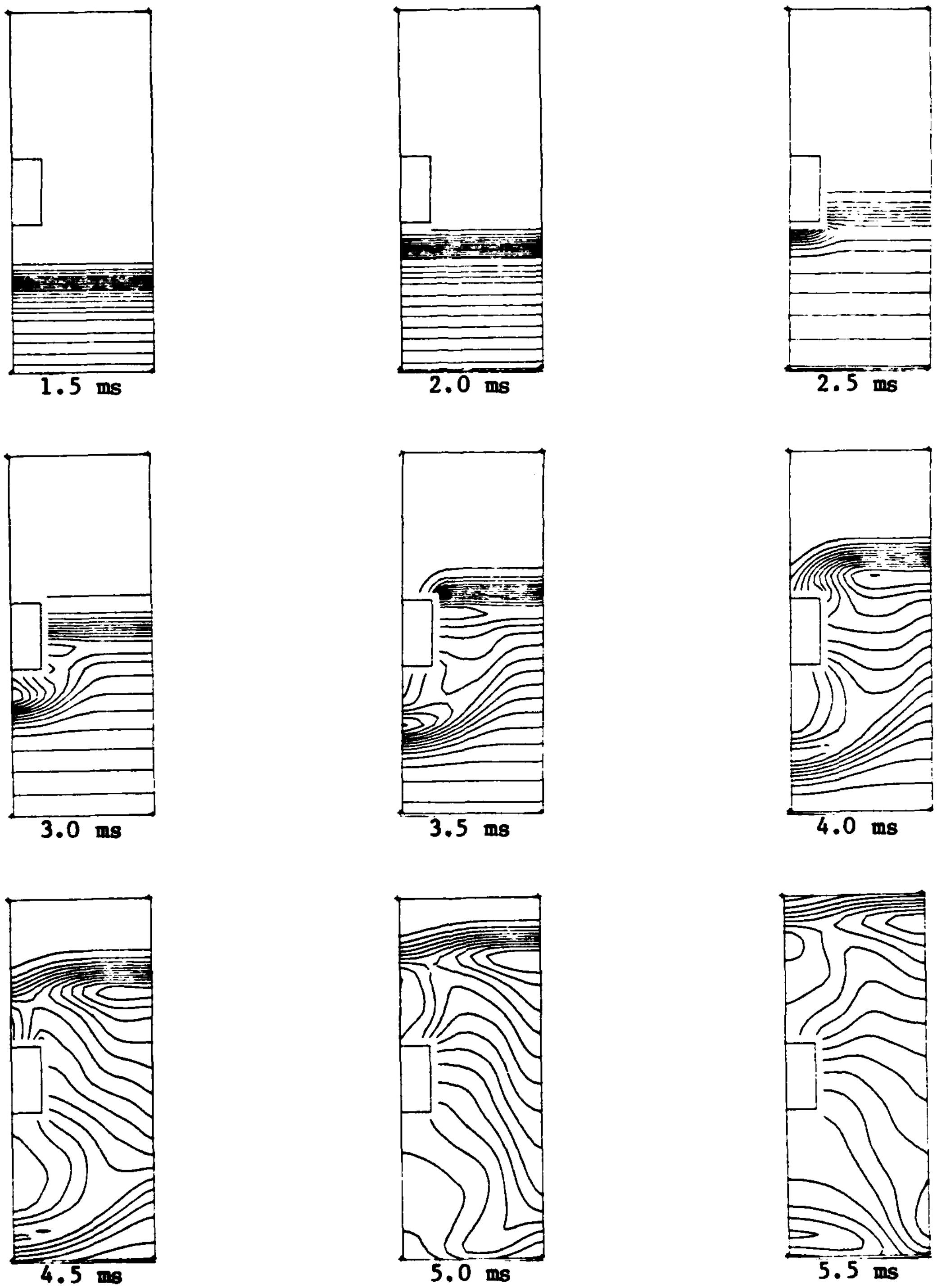


Figure 28(a)
Pressure Contours

Square Body

P_{max} = 3 psi

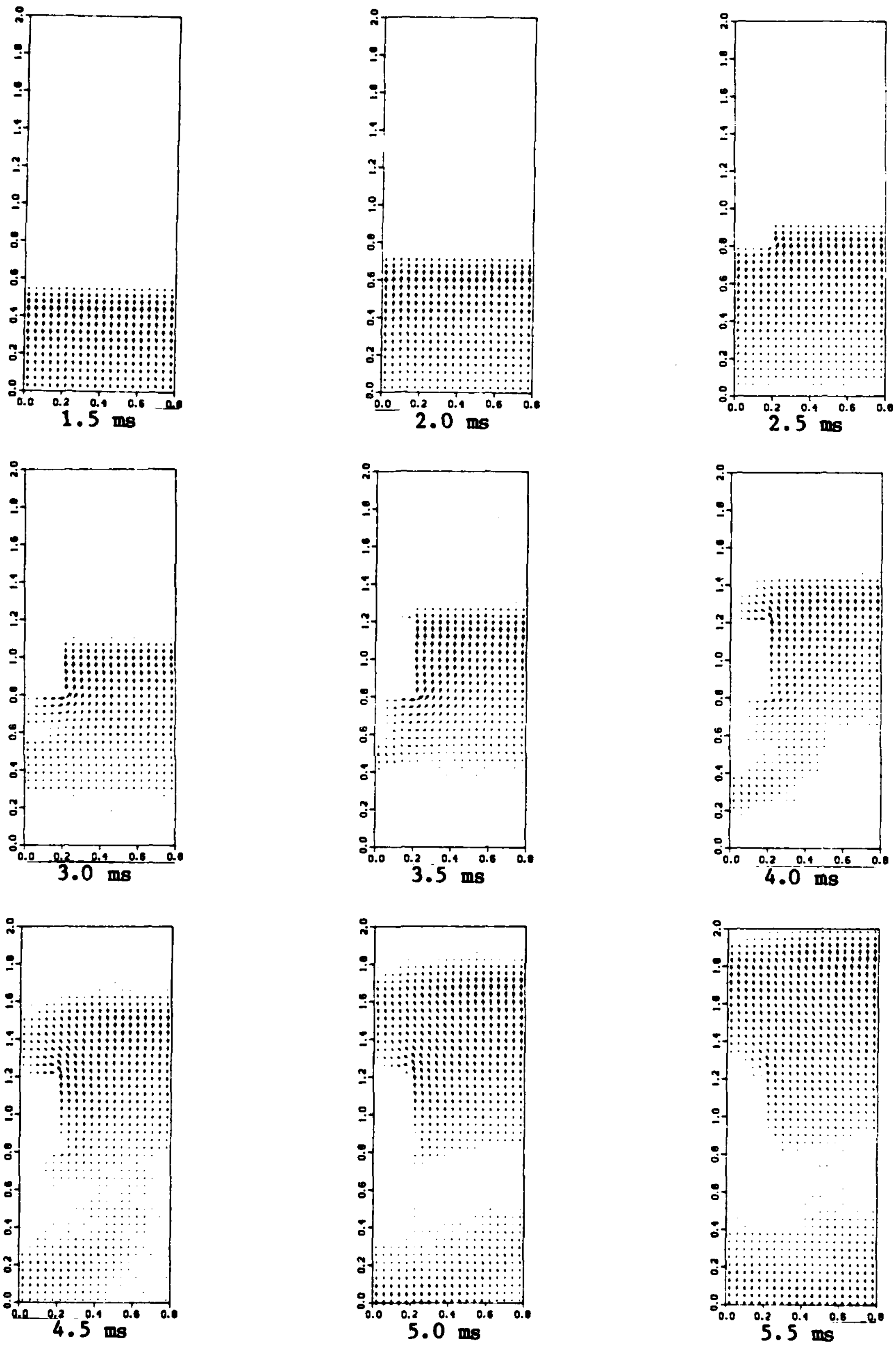
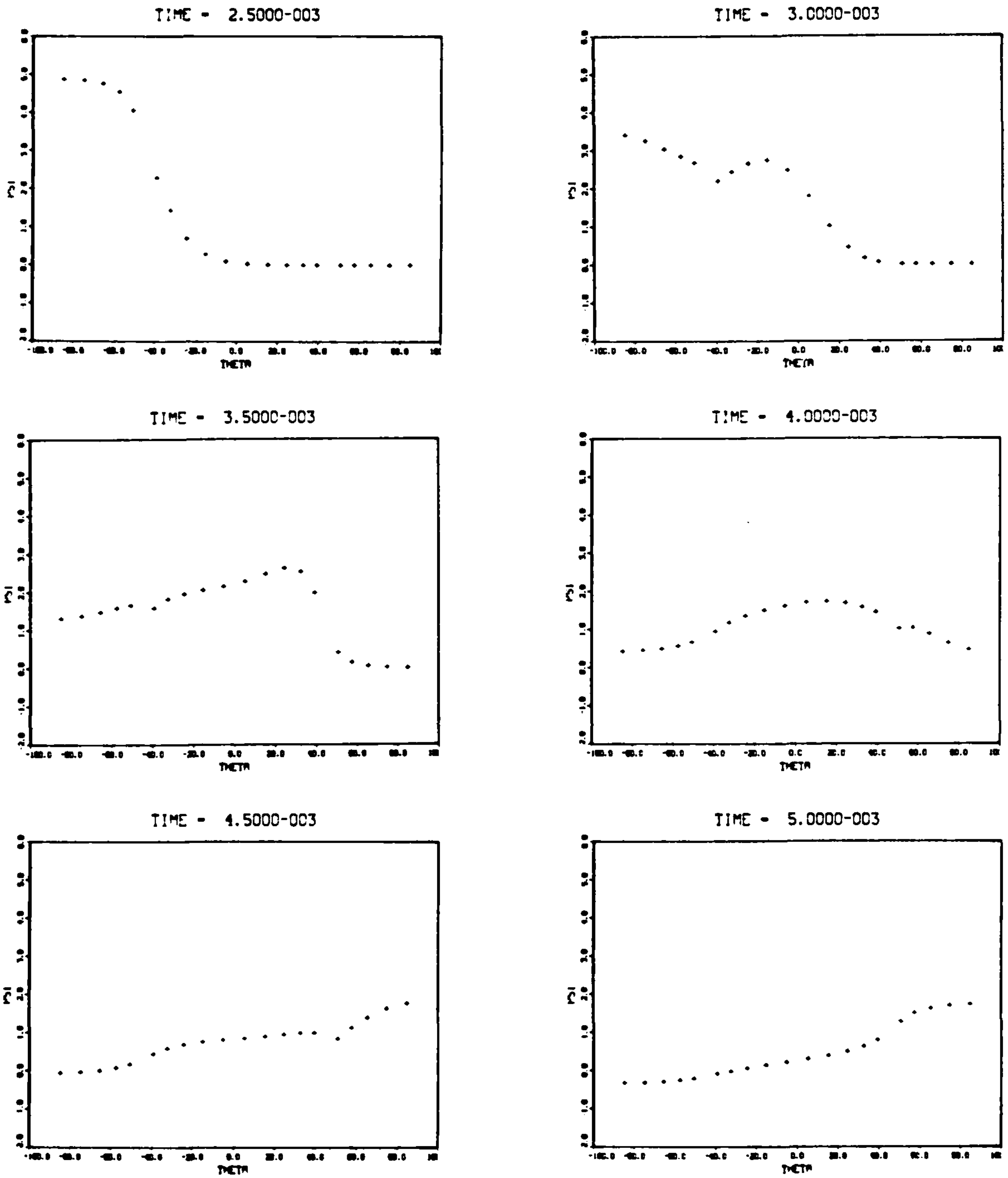


Figure 28(b)
Velocity Vectors

Square Body

P_{max} = 3 psi



Pressure Load Distributions

Square Body

P_{max} = 3 psi

Figure 28(c)

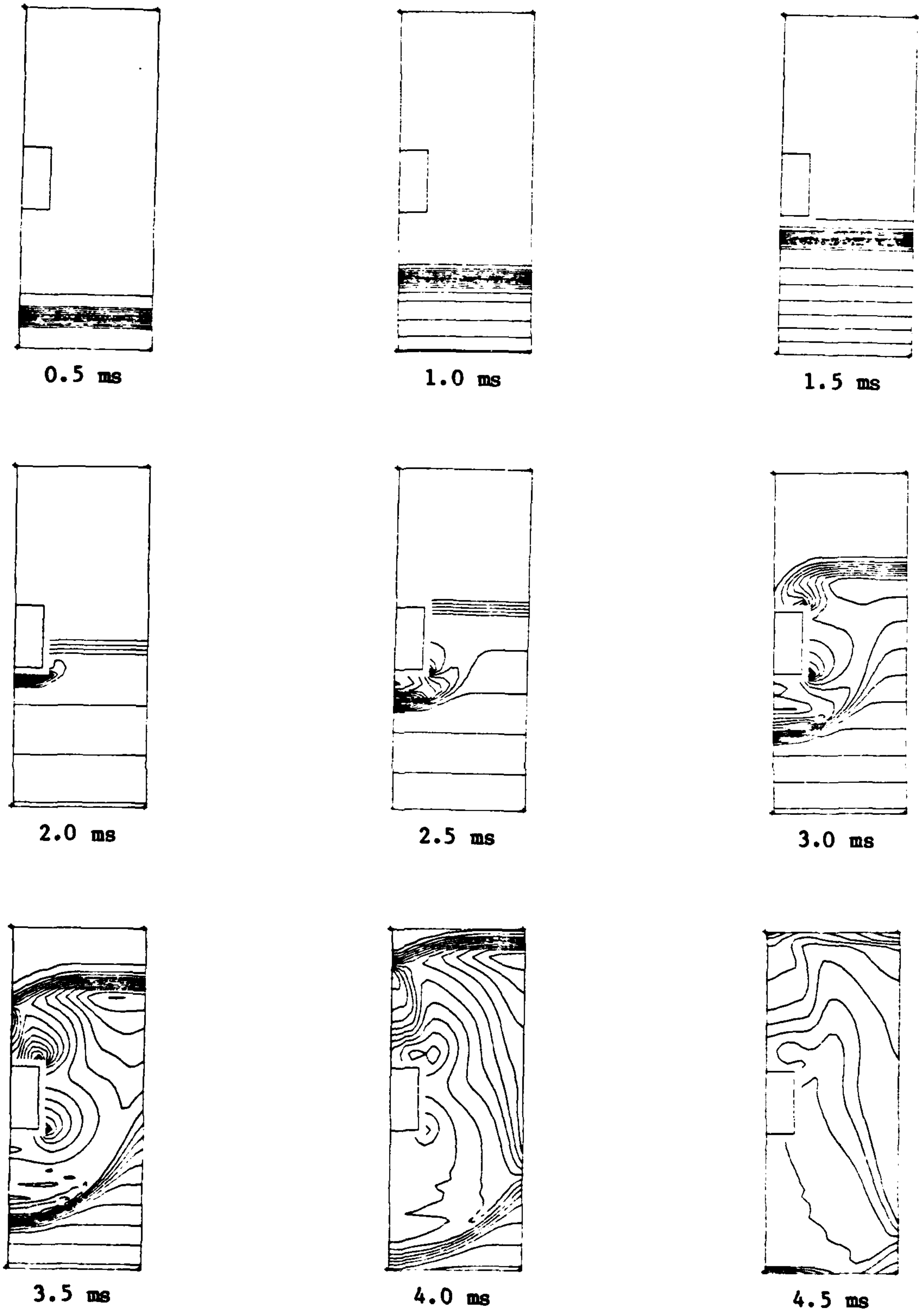


Figure 29(a)
Pressure Contours

Square Body

P_{max} = 20 psi

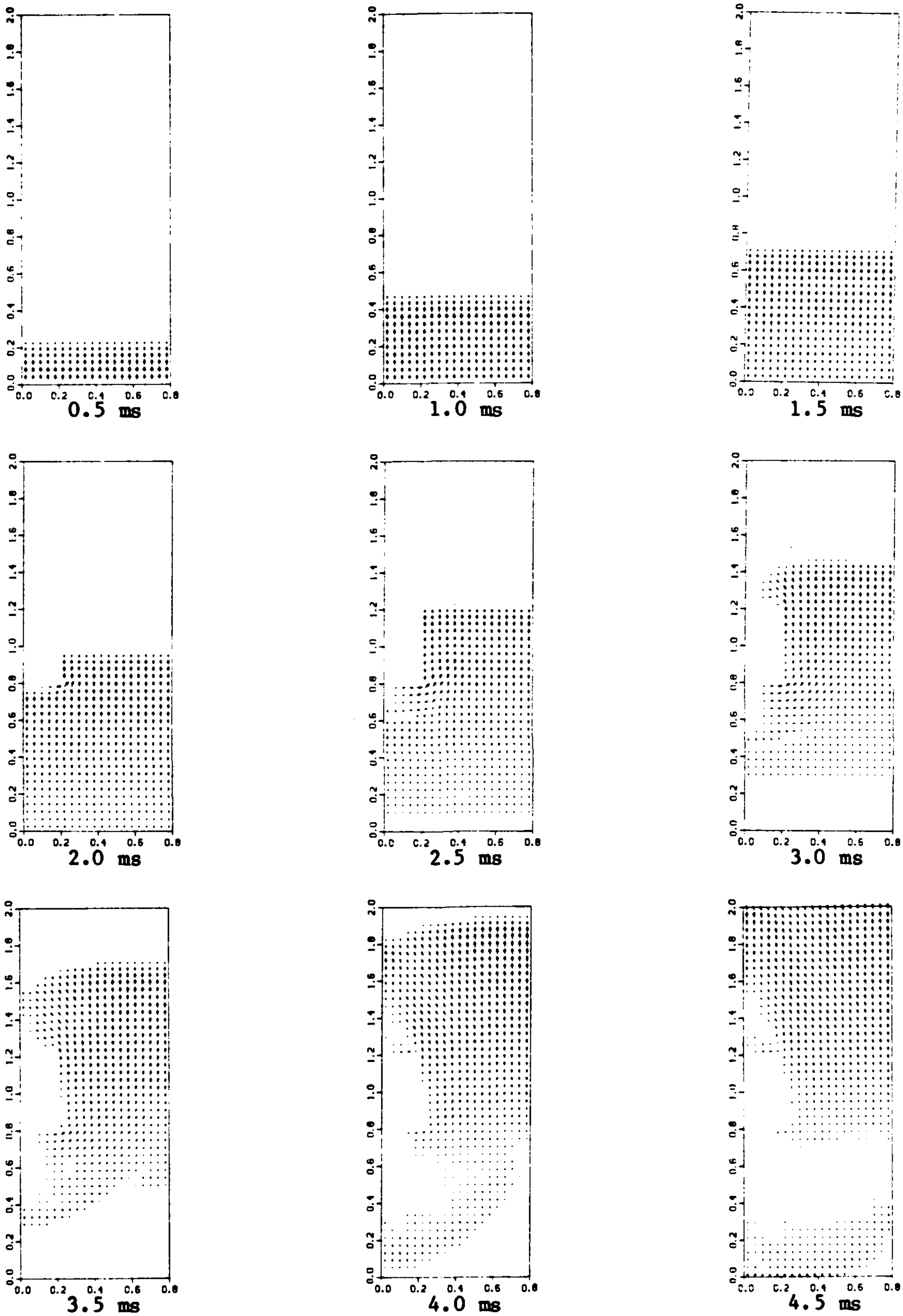


Figure 29(b)
Velocity Vectors
Square Body
P_{max} = 20 psi

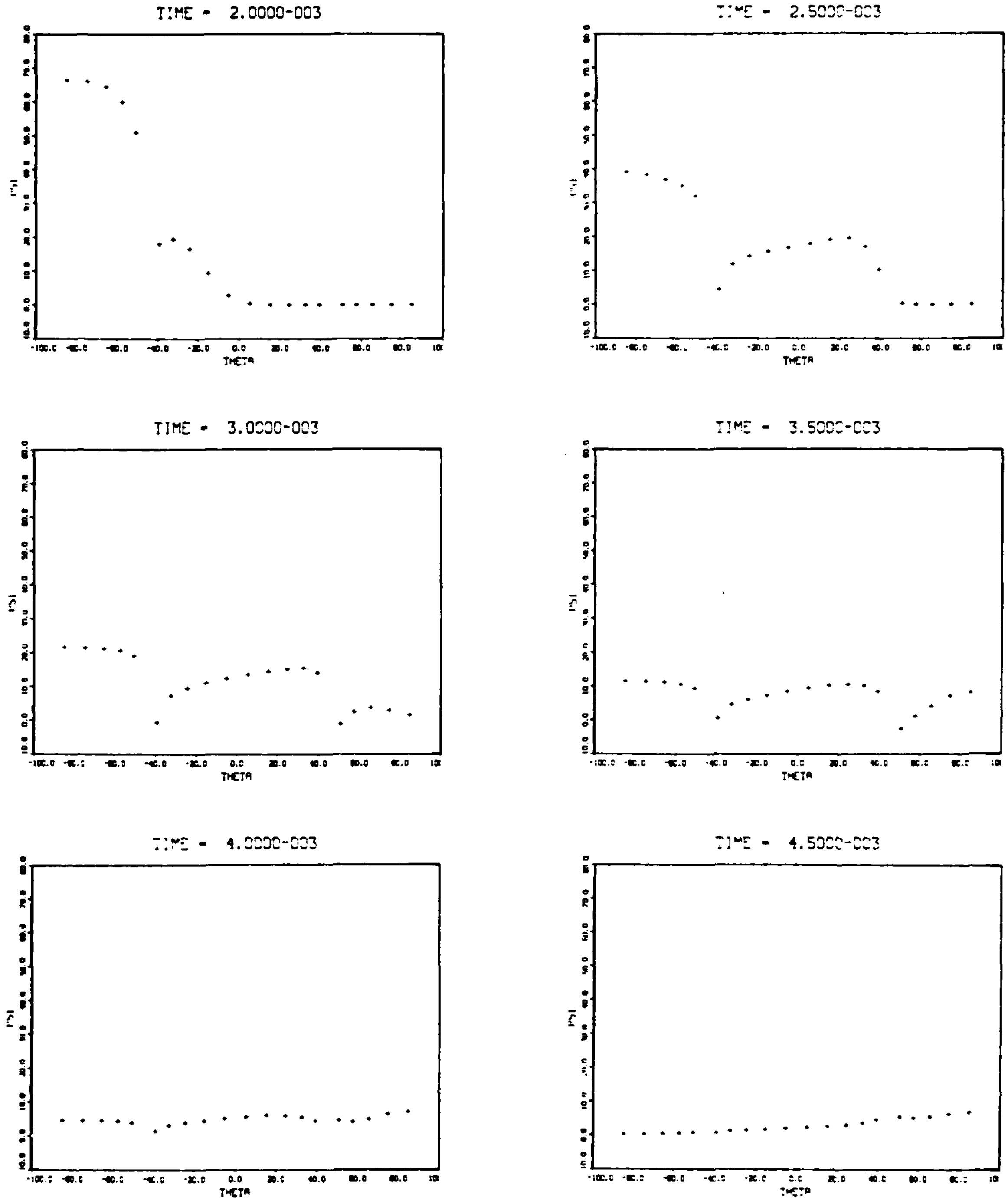


Figure 29(c)
Pressure Load Distributions

Square Body

P_{max} = 20 psi

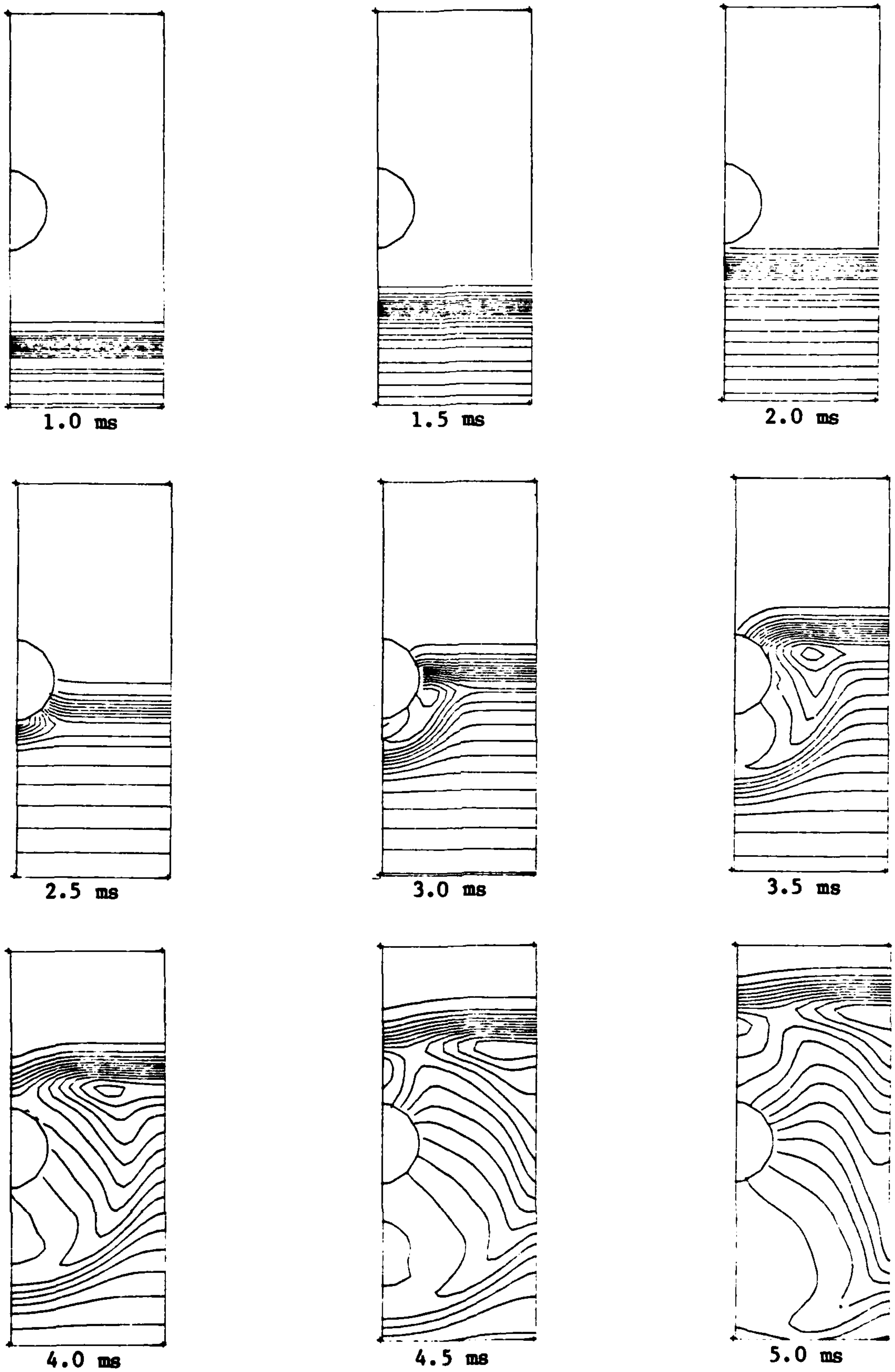


Figure 30(a)
Pressure Contours

Circular Body

$P_{max} = 3$ psi

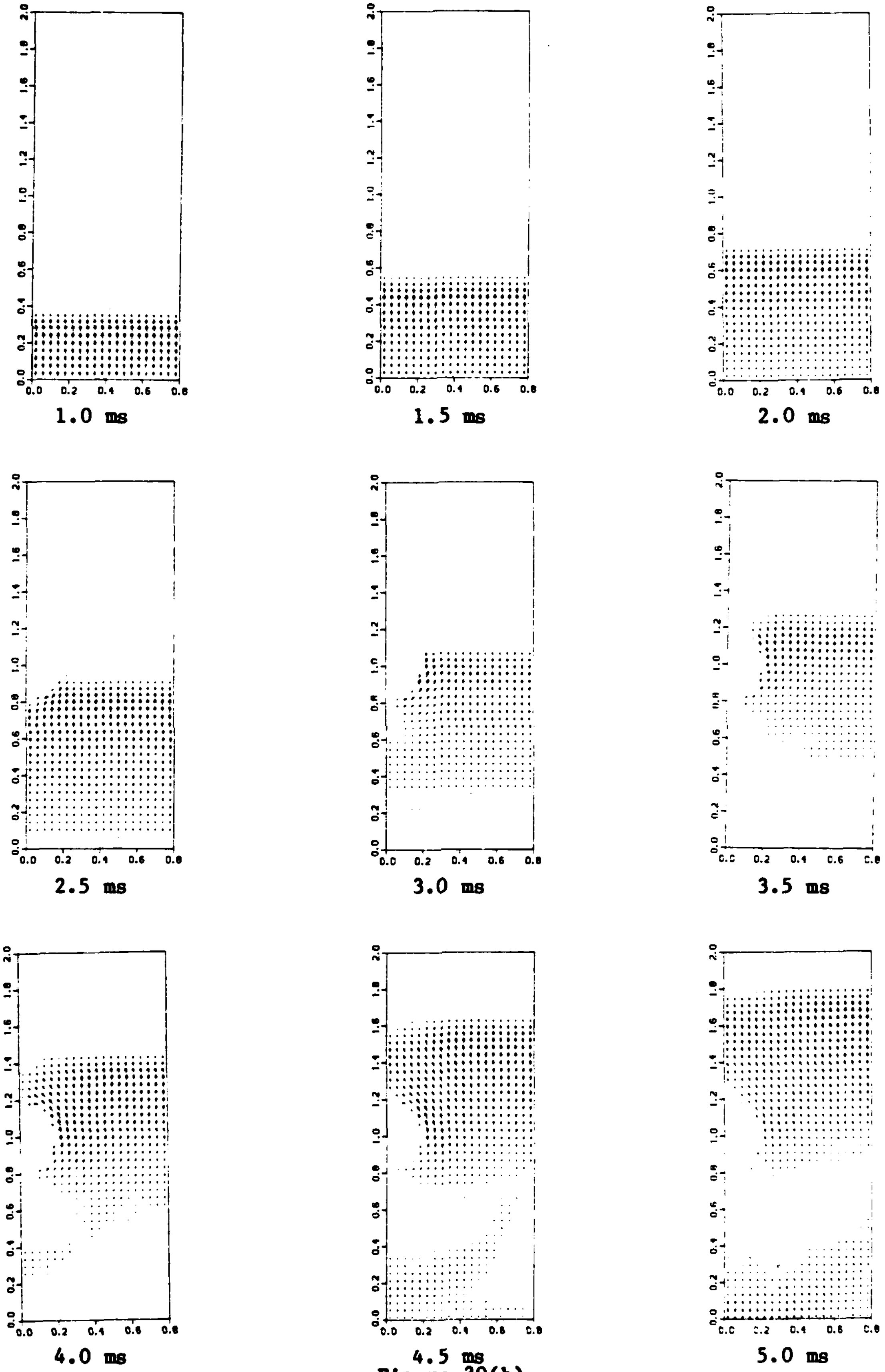


Figure 30(b)
Velocity Vectors

Circular Body

$P_{max} = 3$ psi

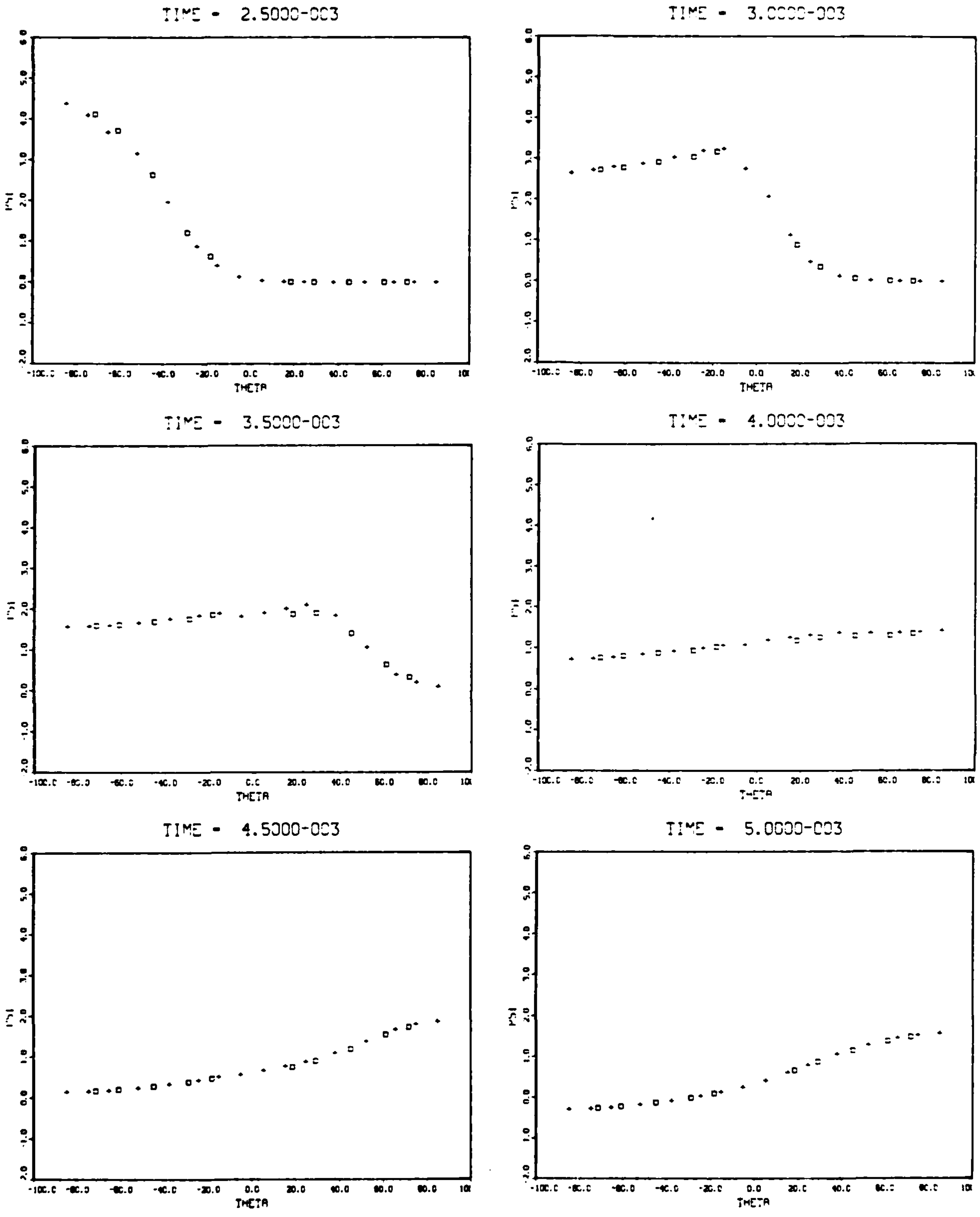


Figure 30(c)
Pressure Load Distributions

Circular Body

P_{max} = 3 psi

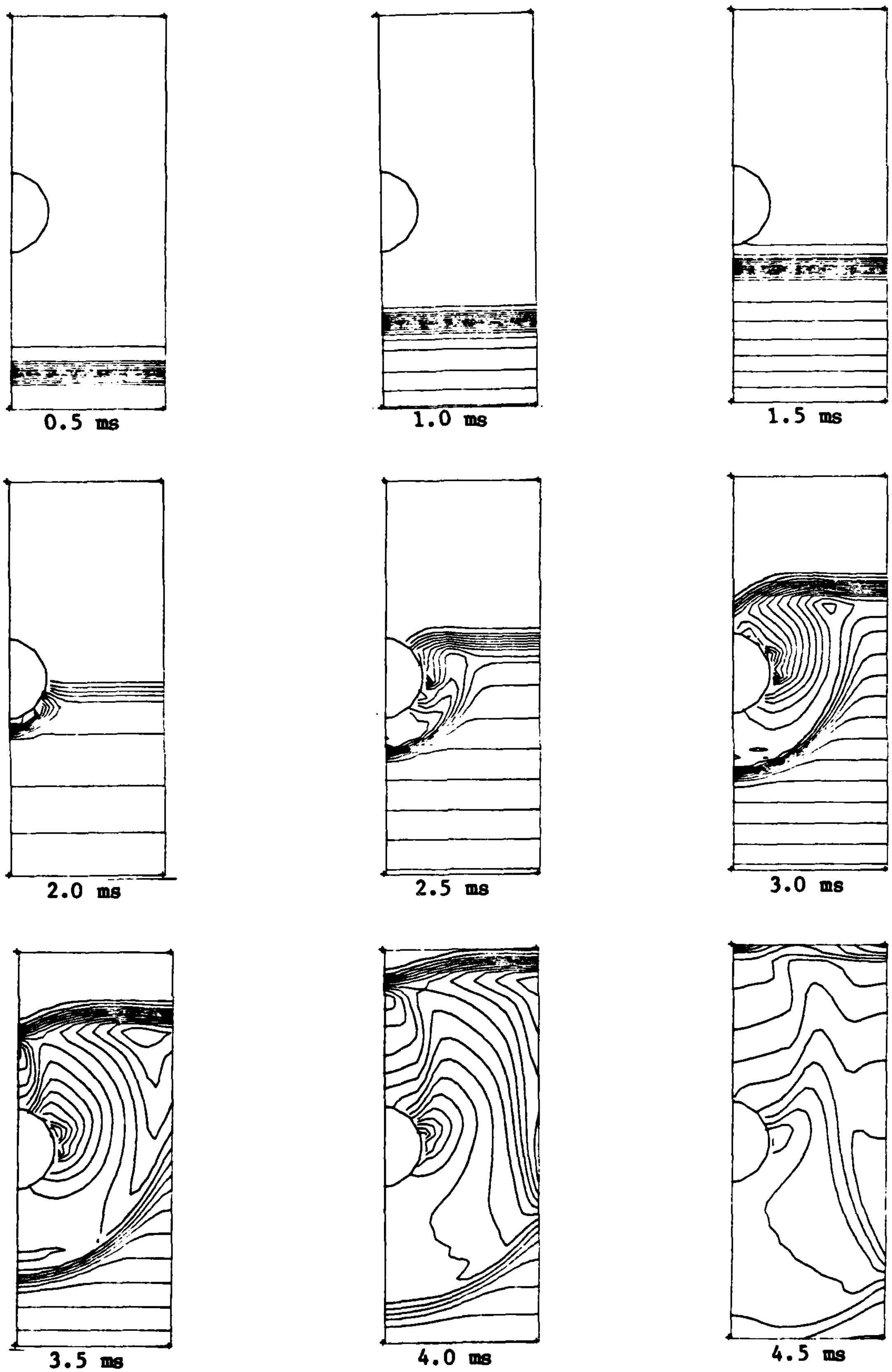


Figure 31(a)
Pressure Contours

Circular Body

P_{max} = 20 psi

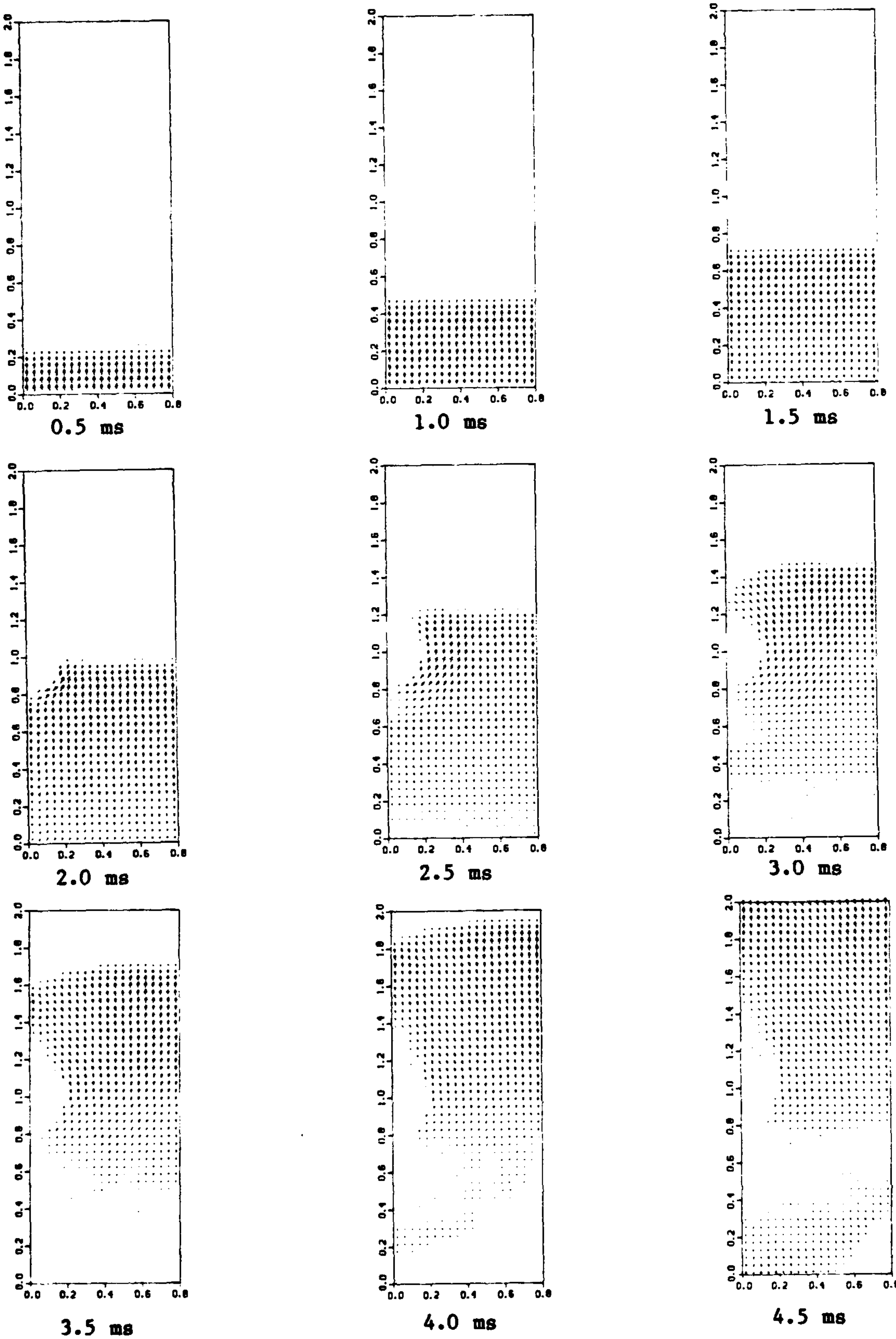


Figure 31(b)
Velocity Vectors

Circular Body

P_{max} = 20 psi

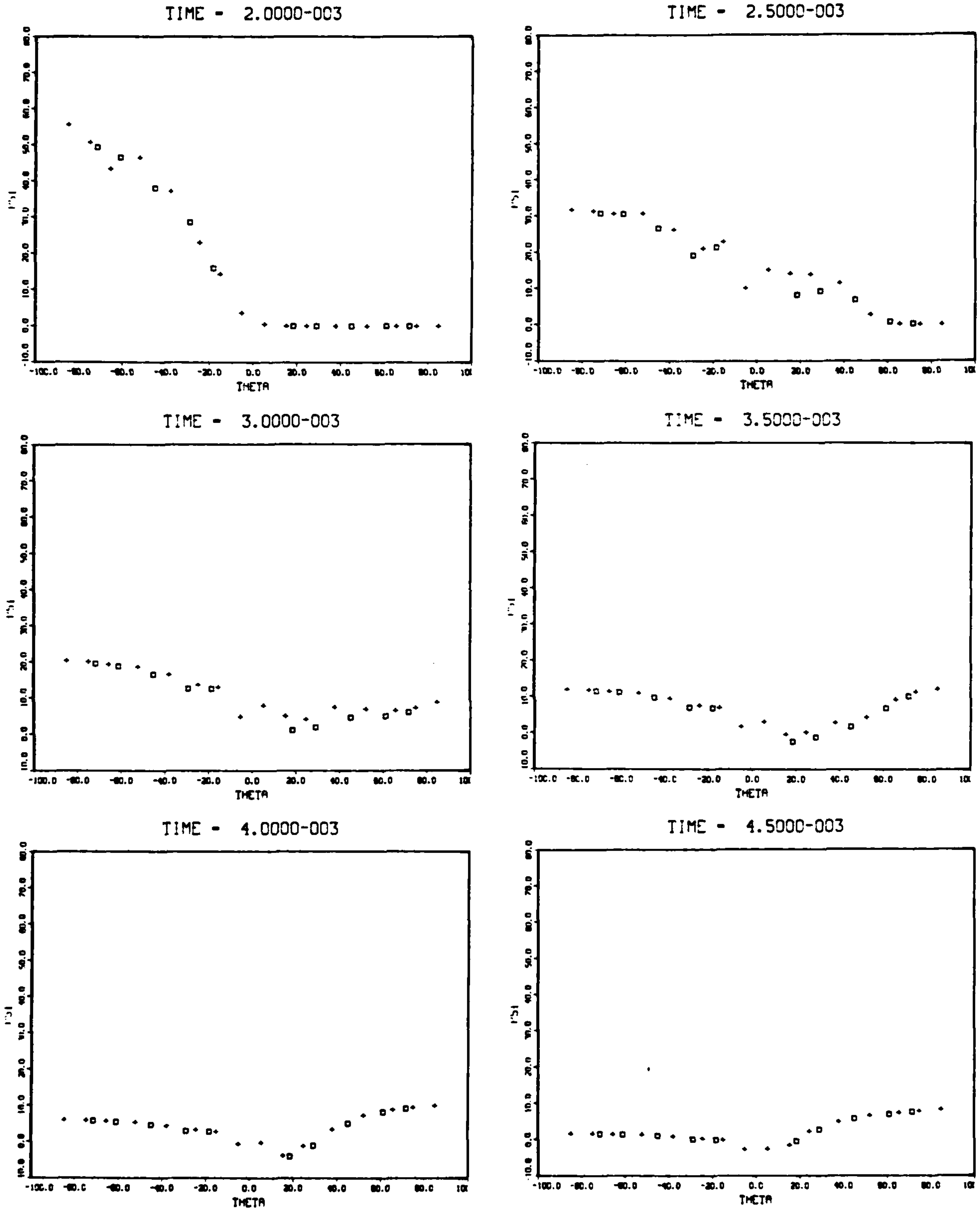


Figure 31(c)
Pressure Load Distributions

Circular Body

P_{max} = 20 psi

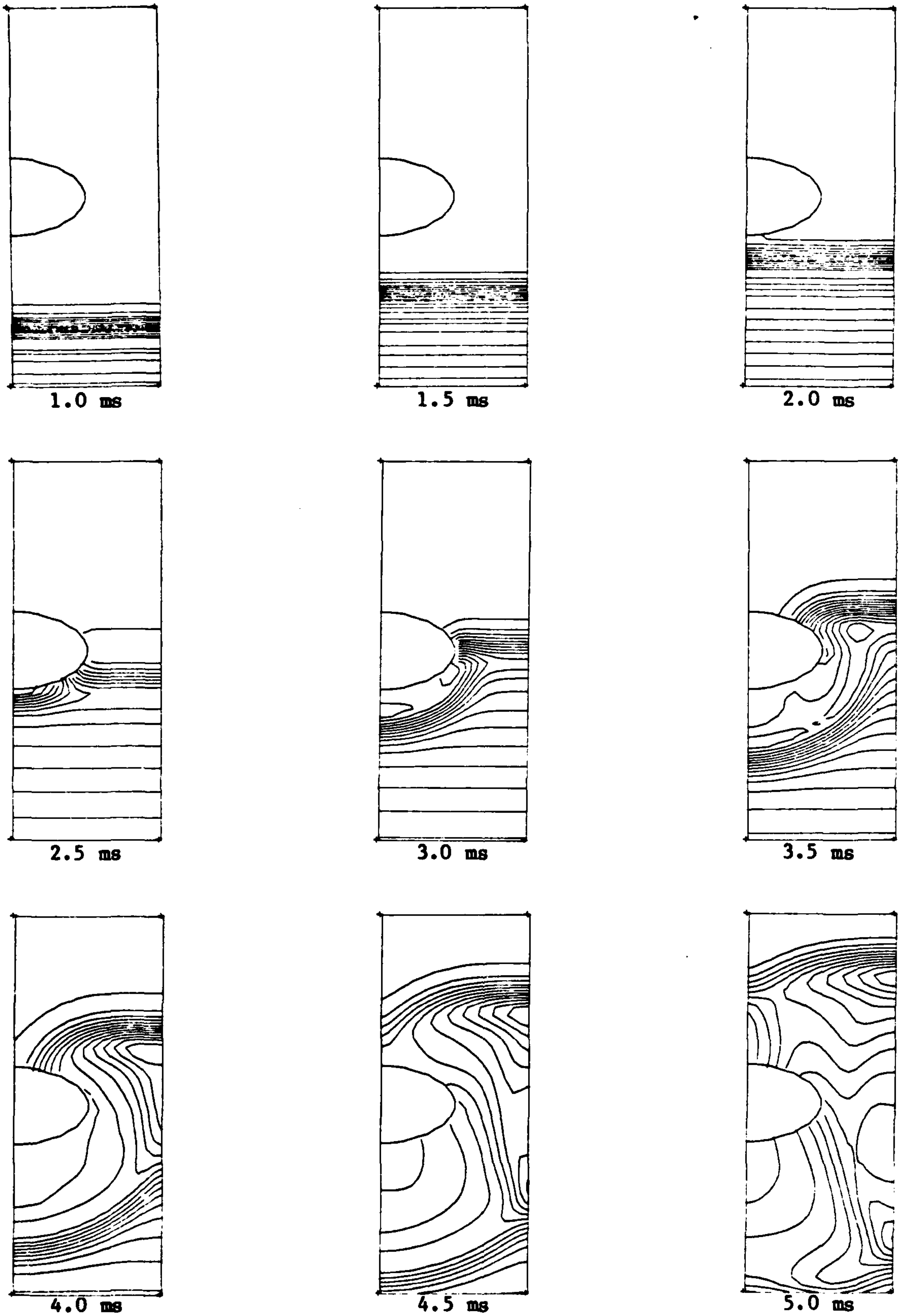


Figure 32(a)
Pressure Contours

Elliptic Body

P_{max} = 3 psi

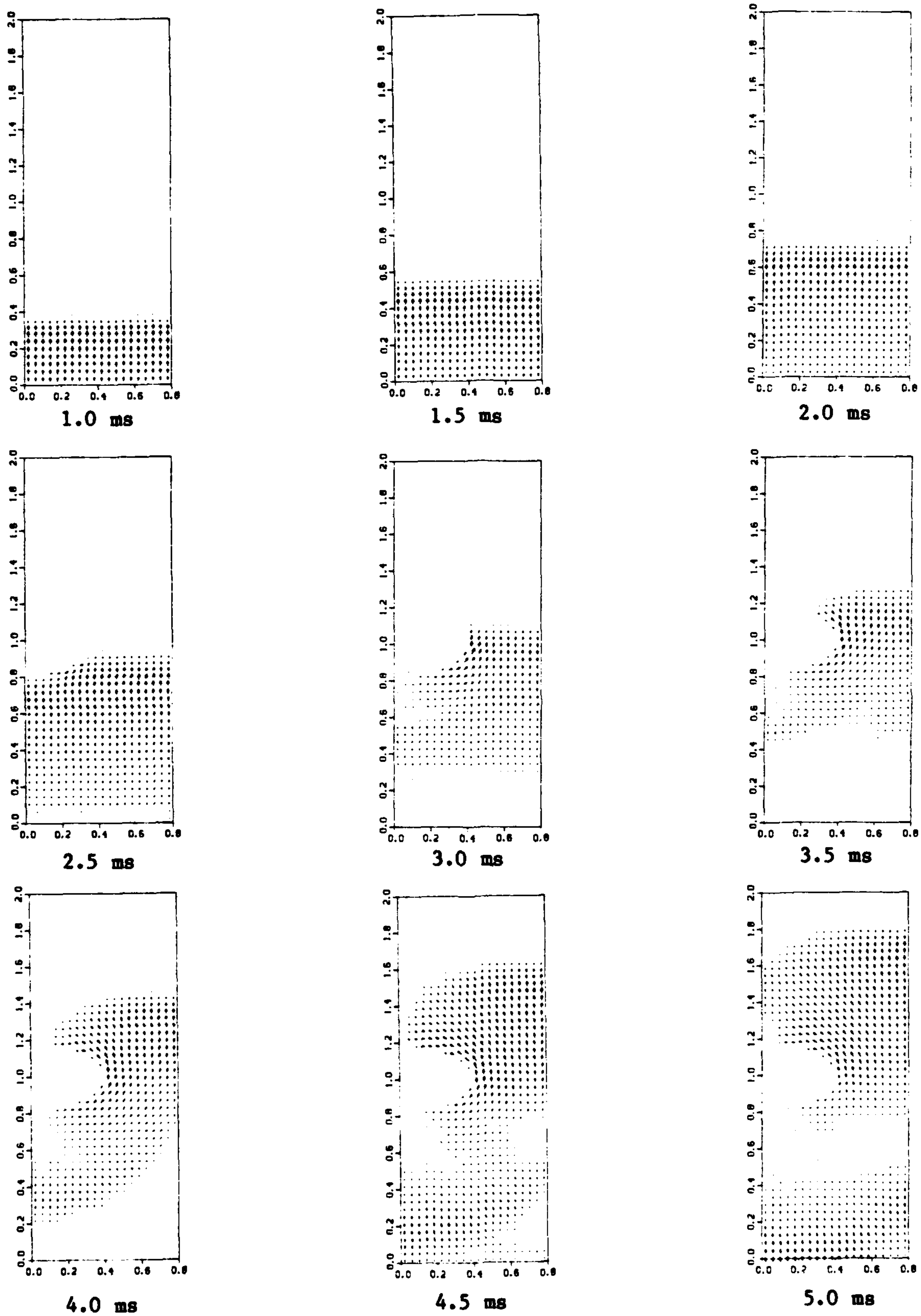


Figure 32(b)
Velocity Vectors

Elliptic Body

P_{max} = 3 psi

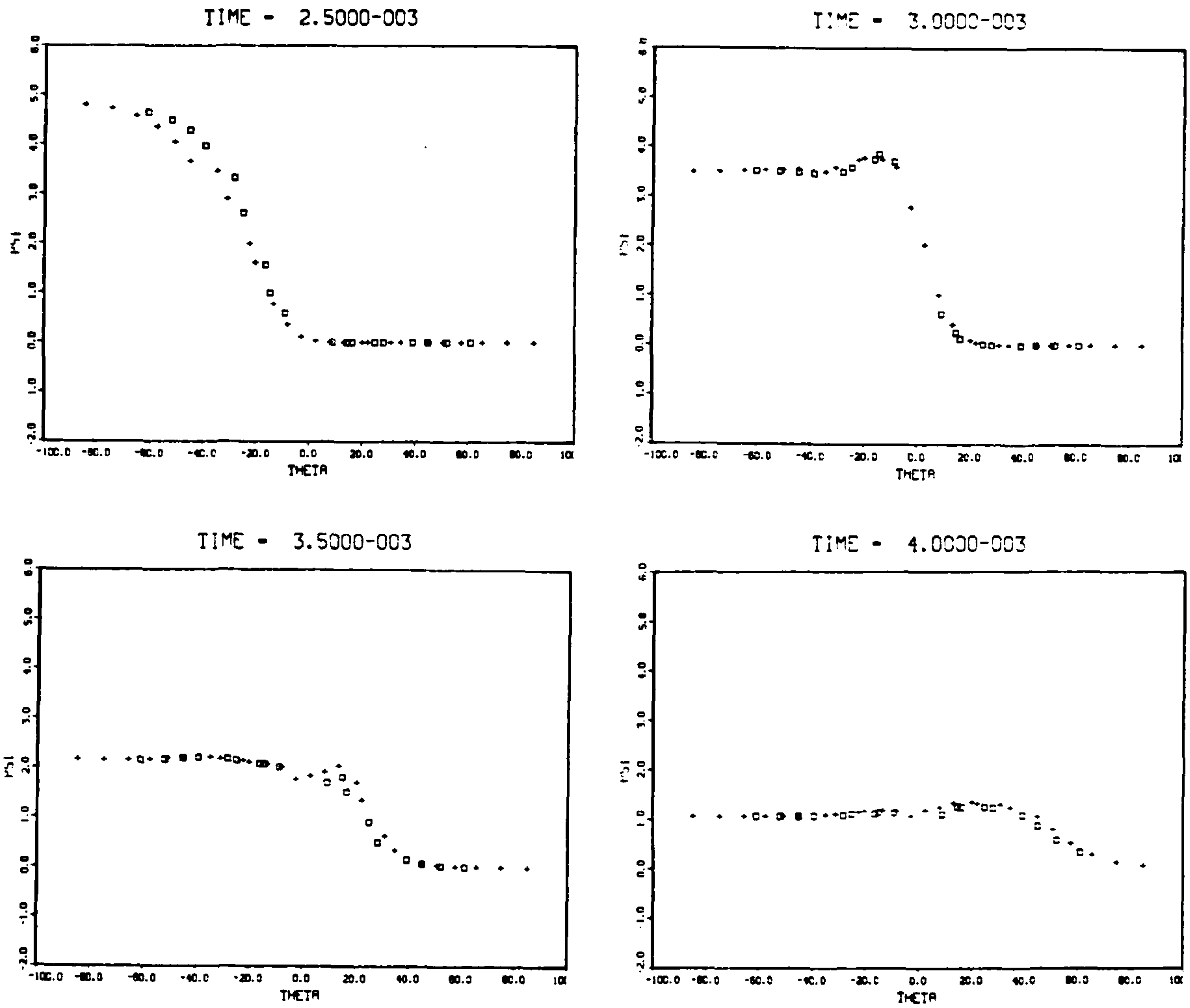


Figure 32(c)
Pressure Load Distributions

Elliptic Body

P_{max} = 3 psi

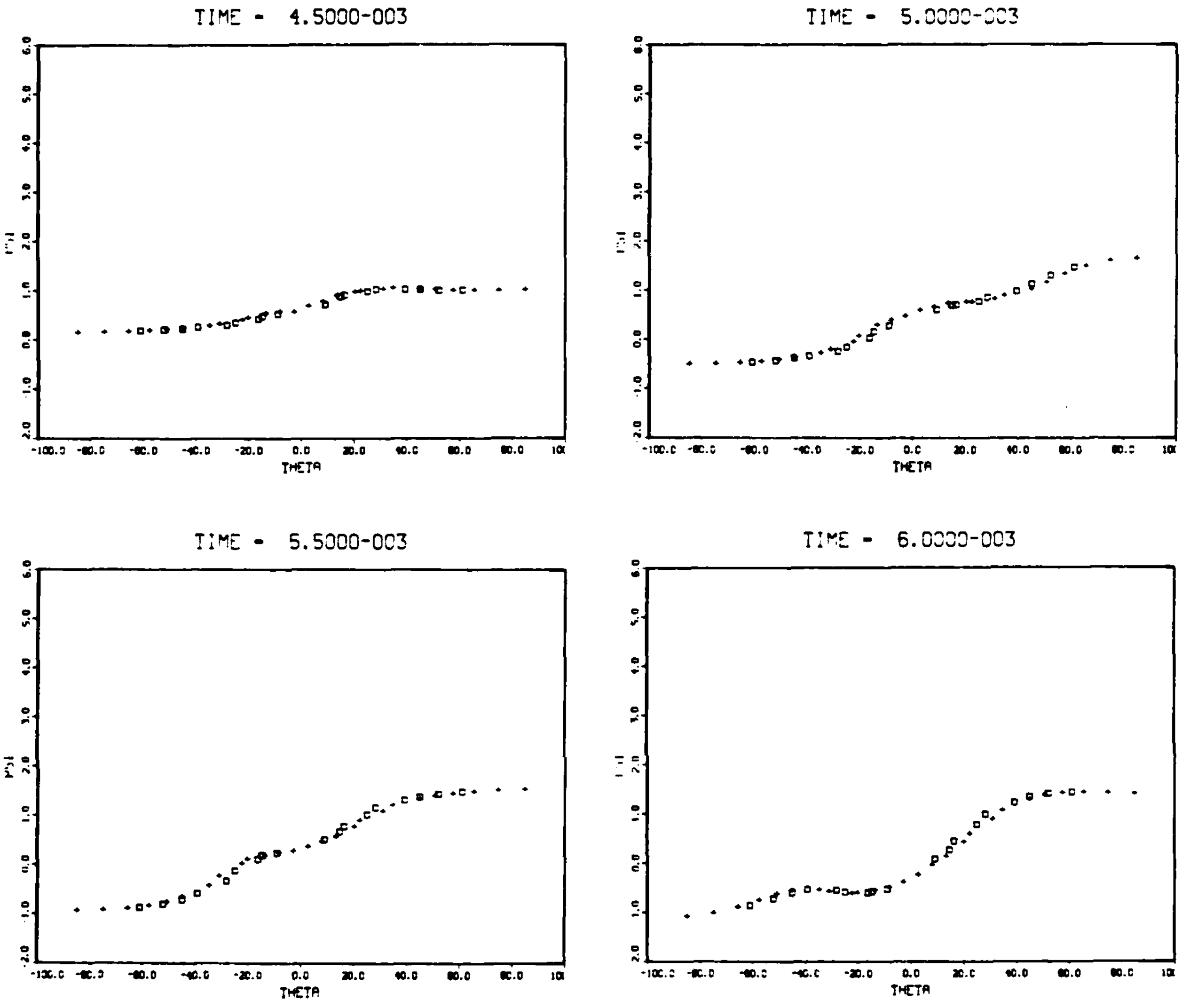


Figure 32(c). (Cont'd)
Pressure Load Distributions

Elliptic Body

P_{max} = 3 psi

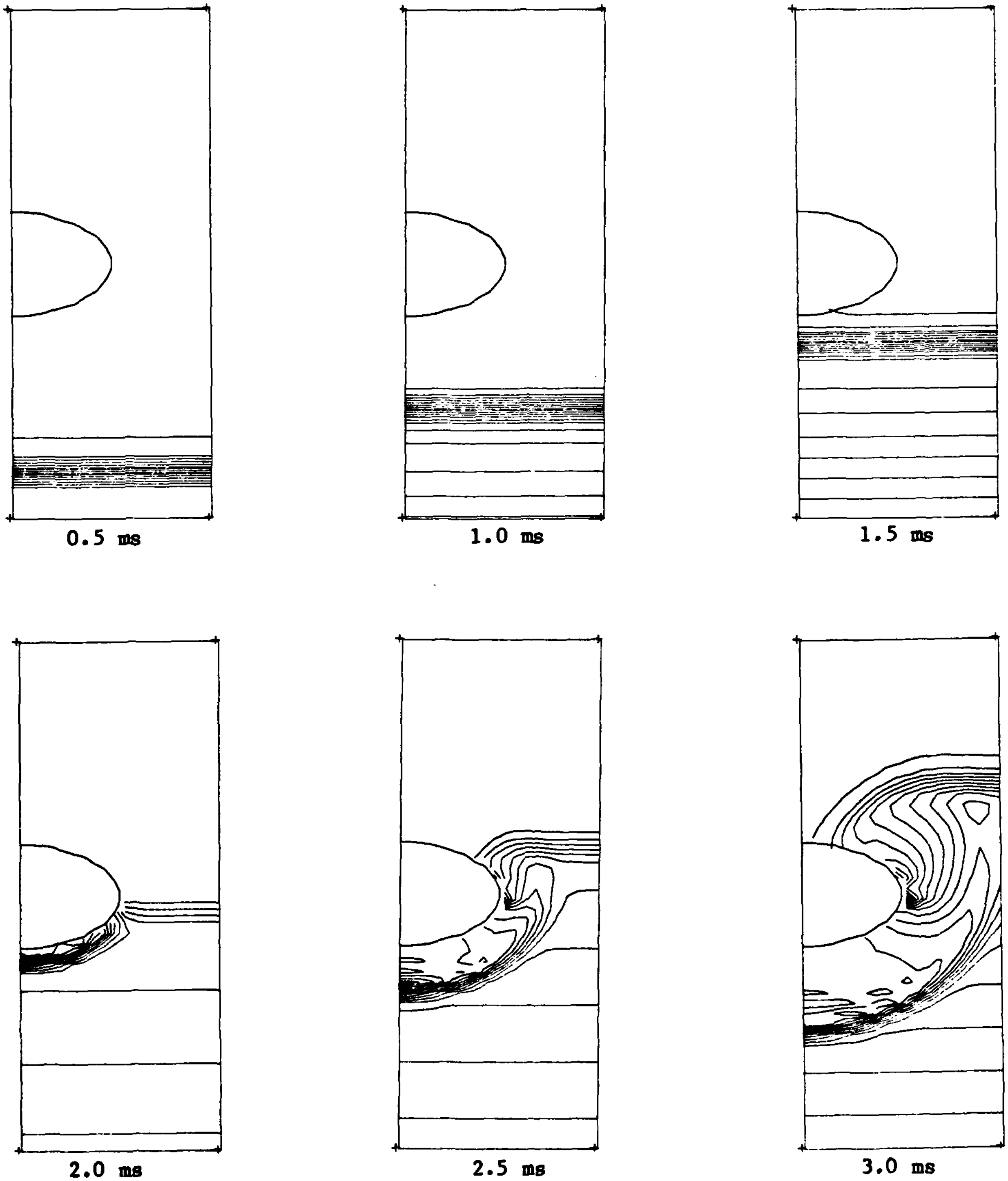


Figure 33(a)
Pressure Contours

Elliptic Body

$P_{max} = 20$ psi

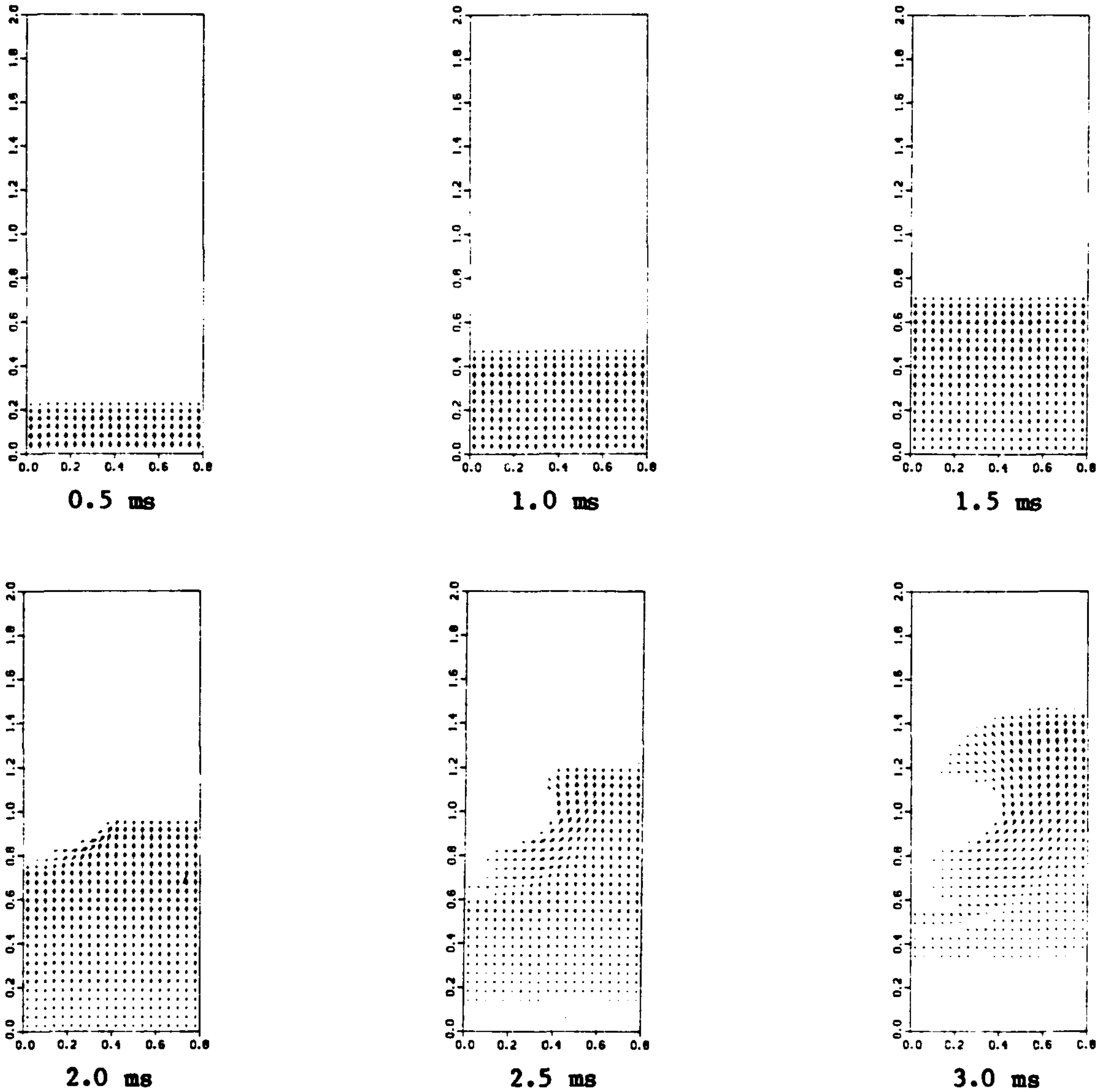


Figure 33(b)
Velocity Vectors
Elliptic Body
P_{max} = 20 psi

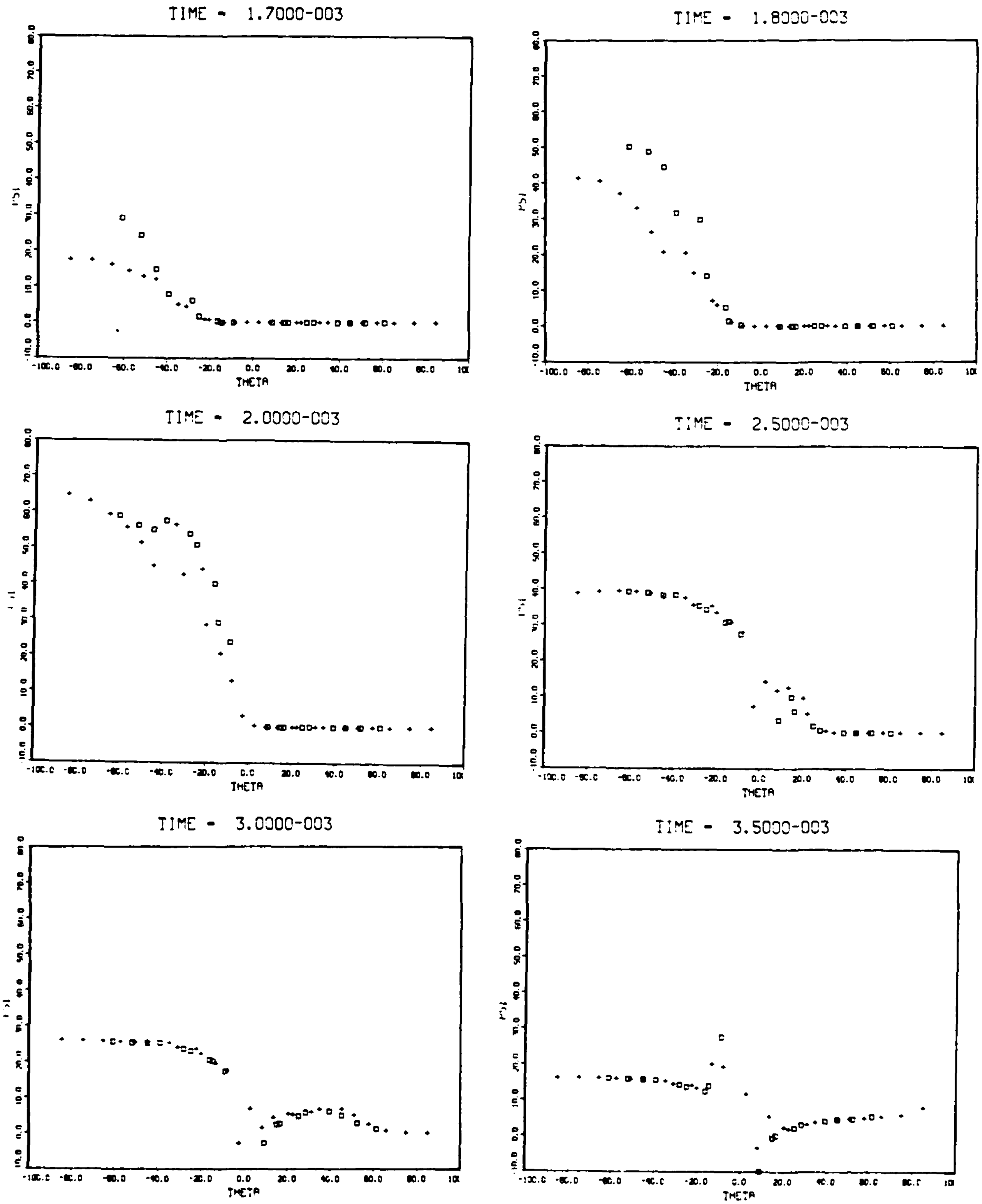


Figure 33(c)
Pressure Load Distribution

Elliptic Body

P_{max} = 20 psi

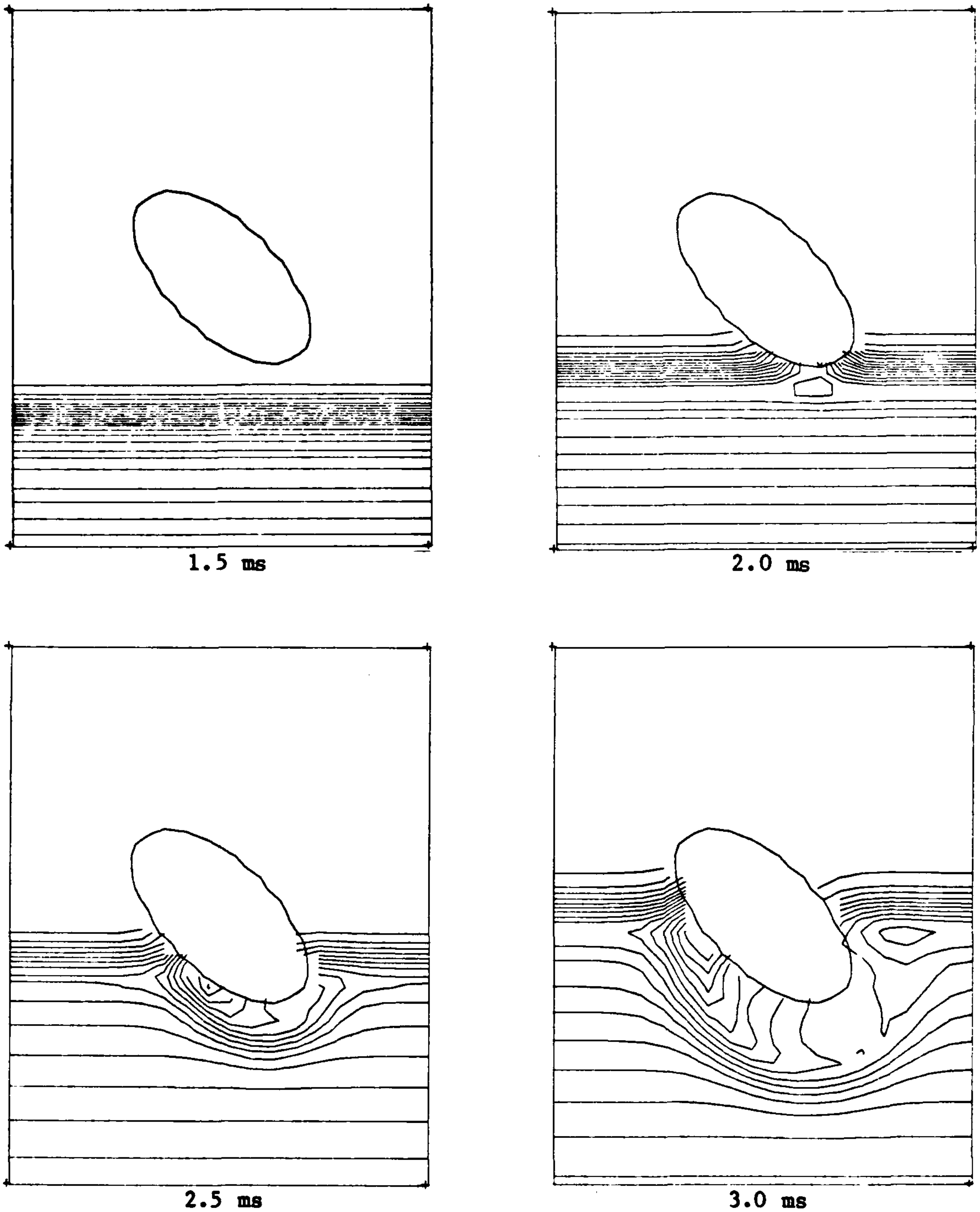


Figure 34(a)
Pressure Contours
Elliptic Body Rotated 45°
P_{max} = 3 psi

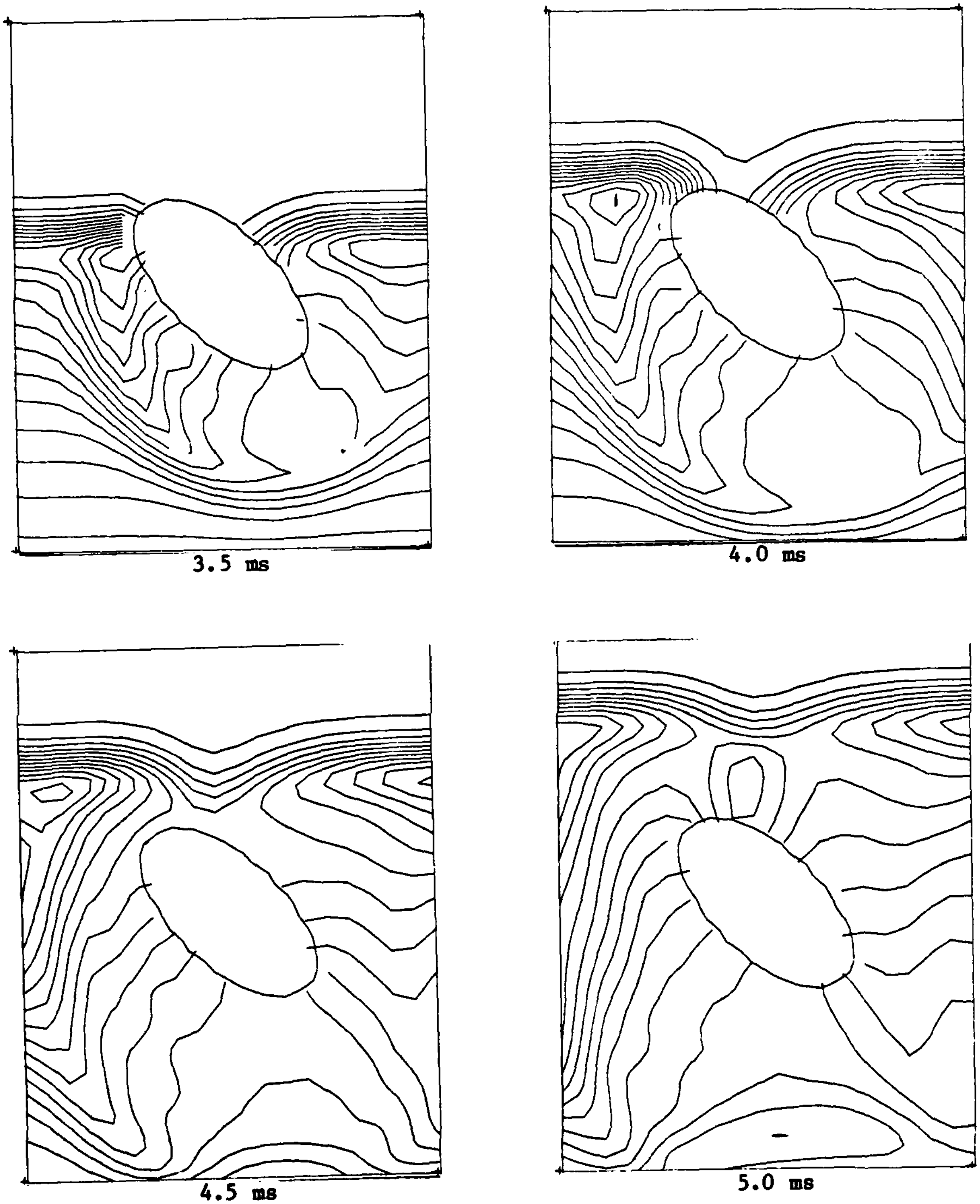


Figure 34(a). (Cont'd)

Pressure Contours

Elliptic Body Rotated 45°

P_{max} = 3 psi

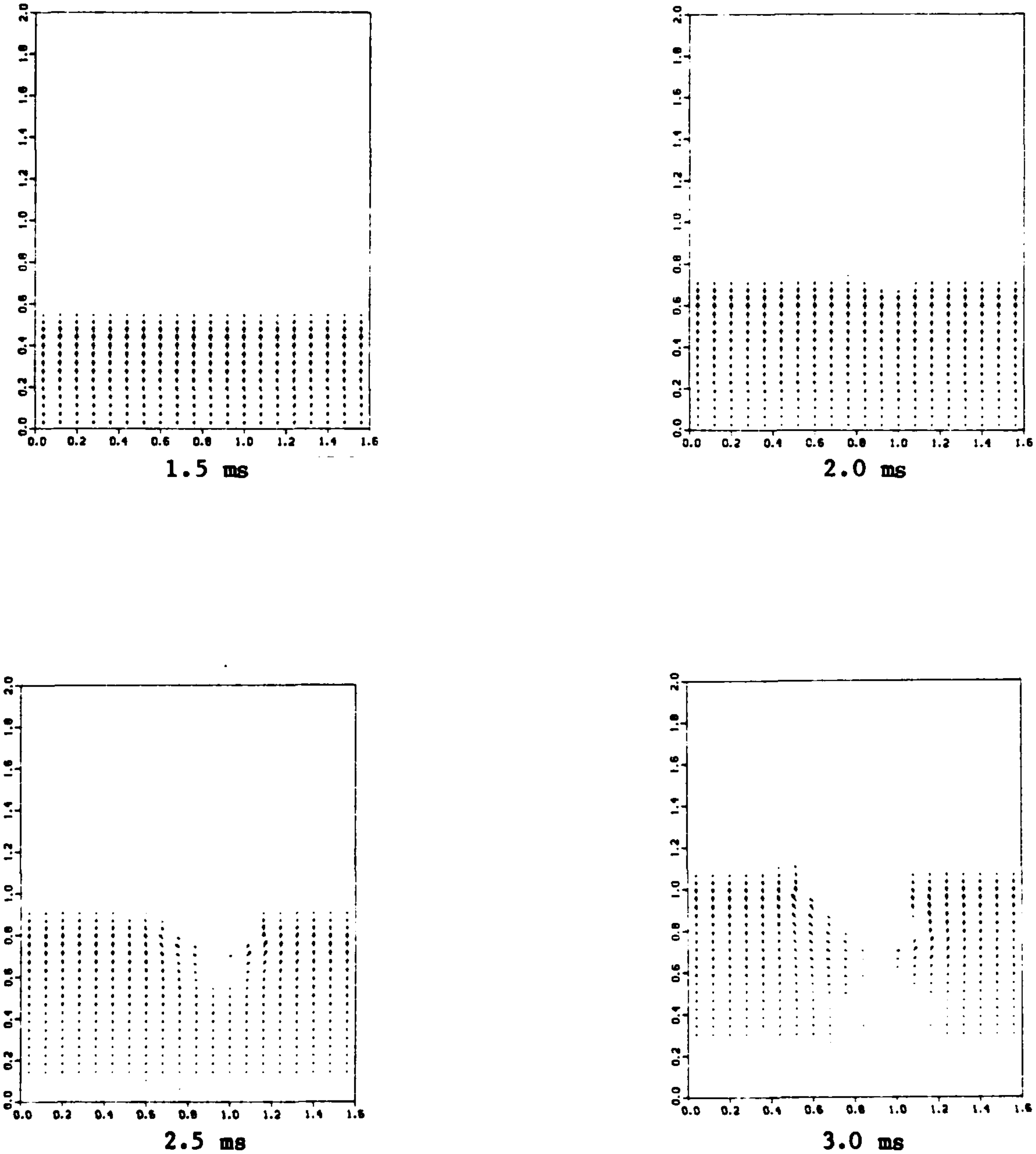


Figure 34(b)
Velocity Vectors
Elliptic Body Rotated 45°
P_{max} = 3 psi

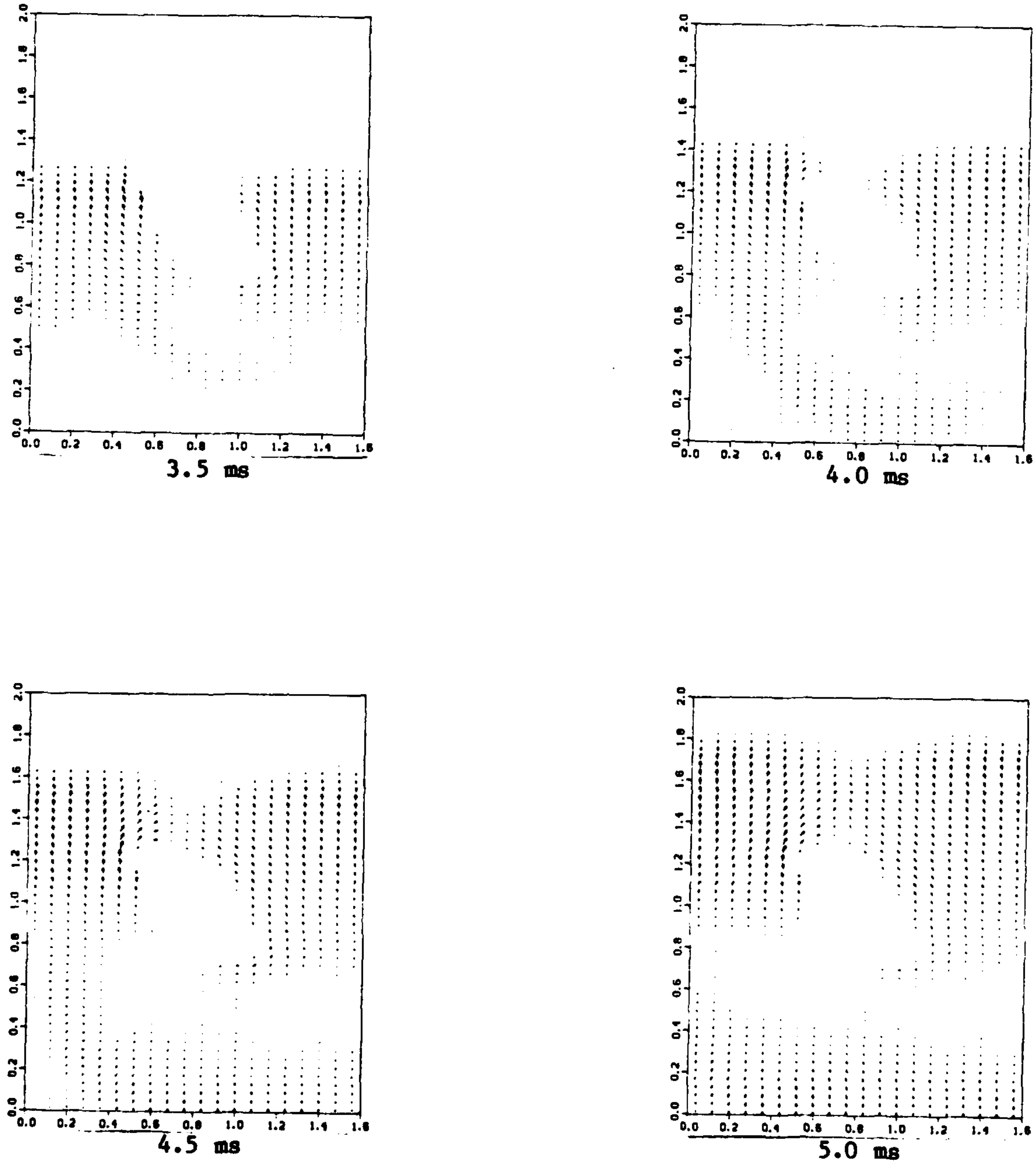


Figure 34(b). (Cont'd)

Velocity Vectors

Elliptic Body Rotated 45°

P_{max} = 3 psi

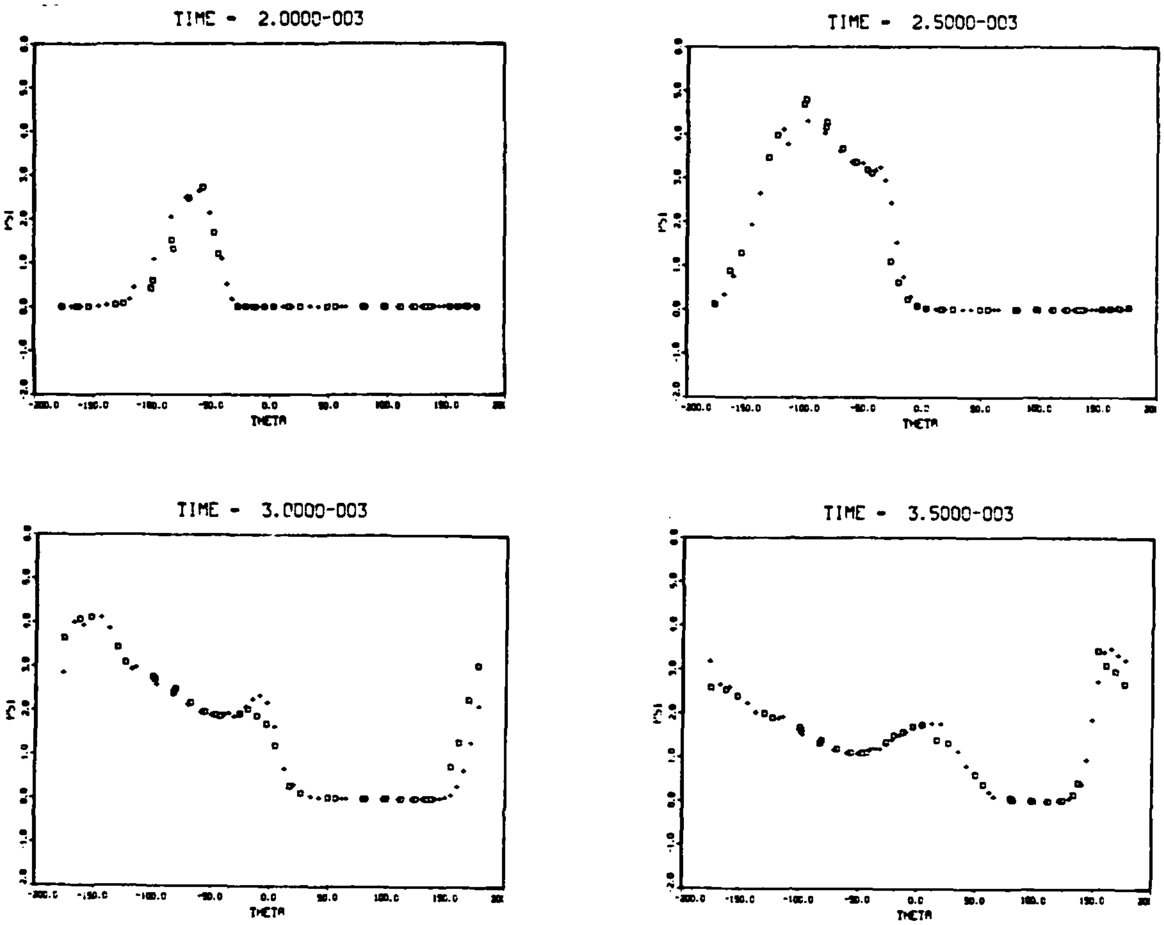


Figure 34(c)
Pressure Load Distributions
Elliptic Body Rotated 45°
P_{max} = 3 psi

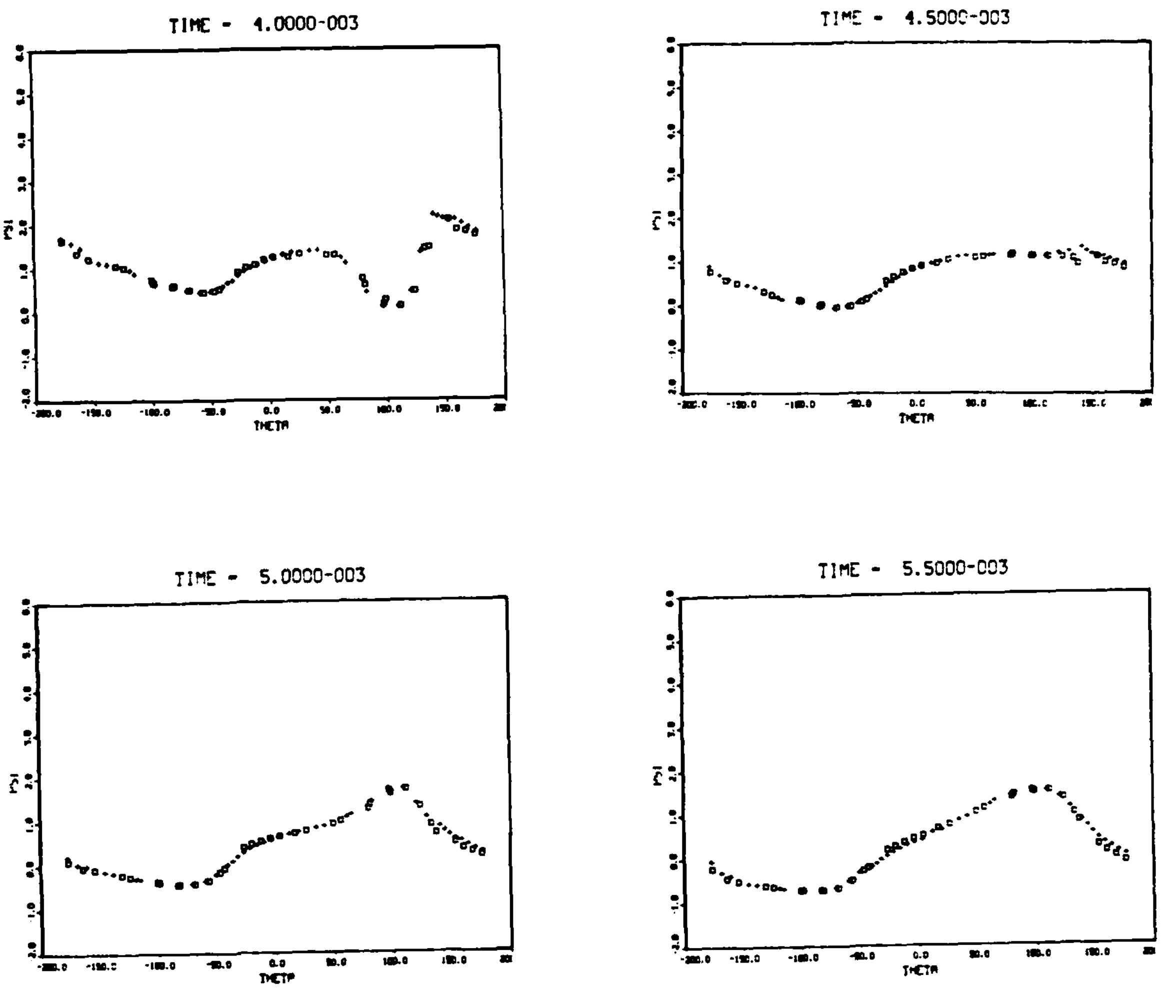


Figure 34(c). (Cont'd)
Pressure Load Distributions
Elliptic Body Rotated 45°
P_{max} = 3 psi

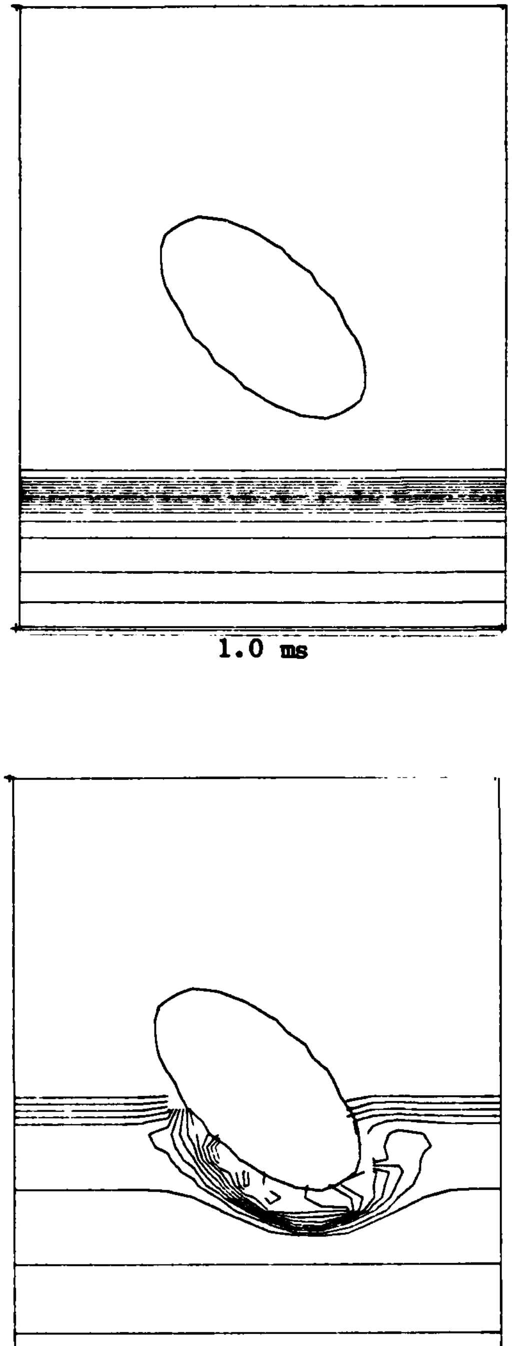


Figure 35(a)

Pressure Contours

Elliptic Body Rotated 45°

P_{max} = 20 psi

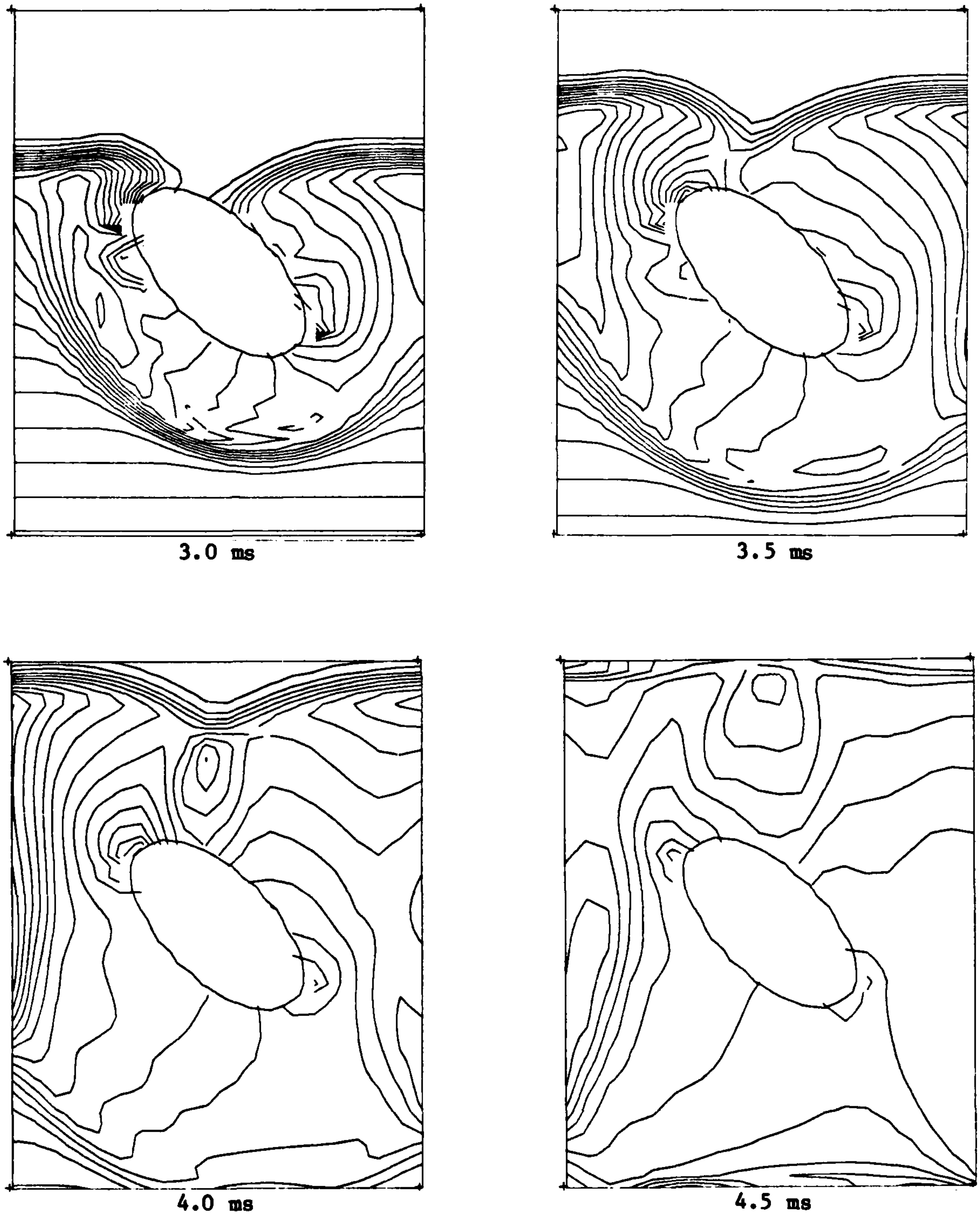


Figure 35(a). (Cont'd)

Pressure Contours

Elliptic Body Rotated 45°

P_{max} = 20 psi

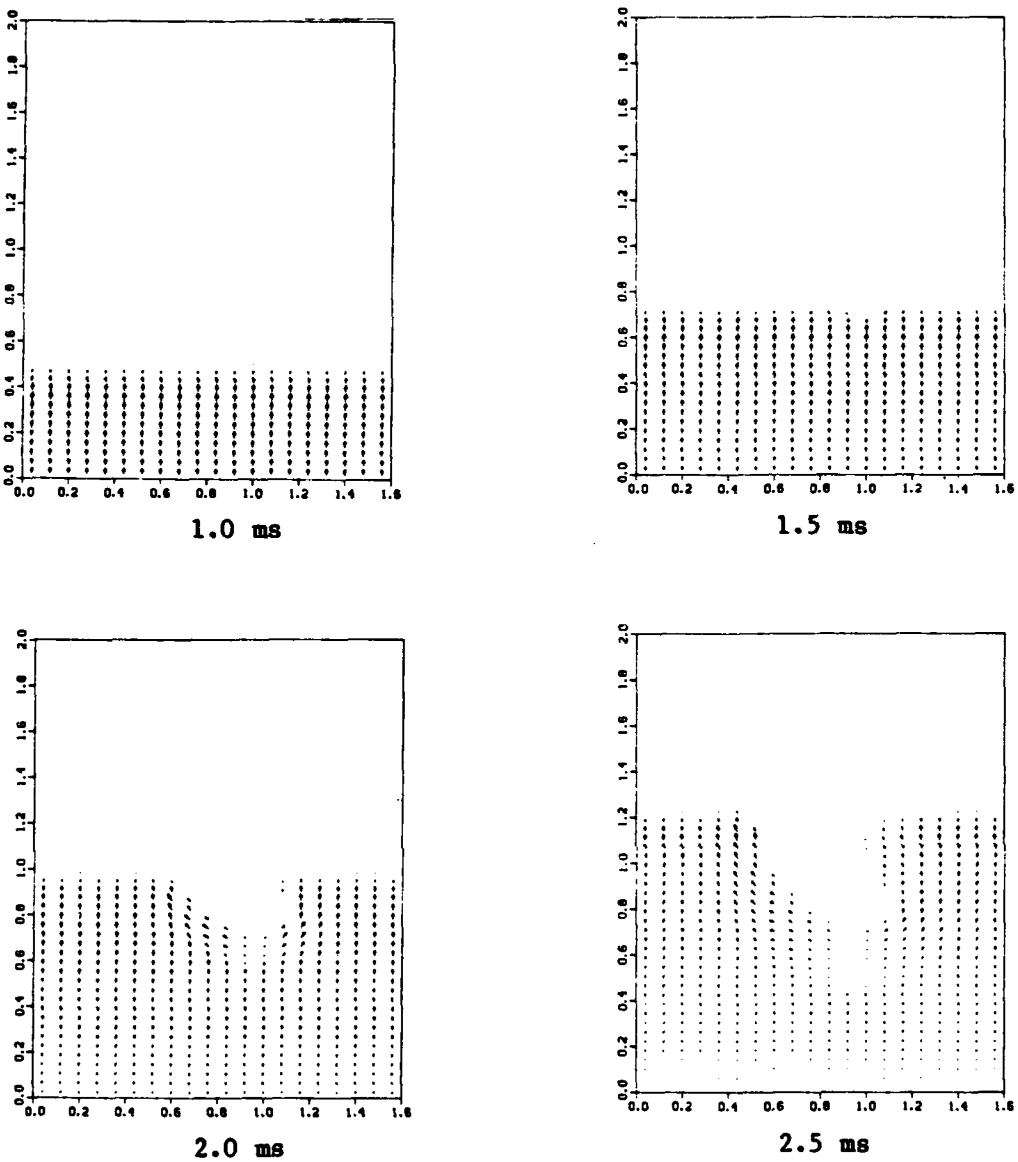


Figure 35(b)

Velocity Vectors

Elliptic Body Rotated 45°

P_{max} = 20 psi

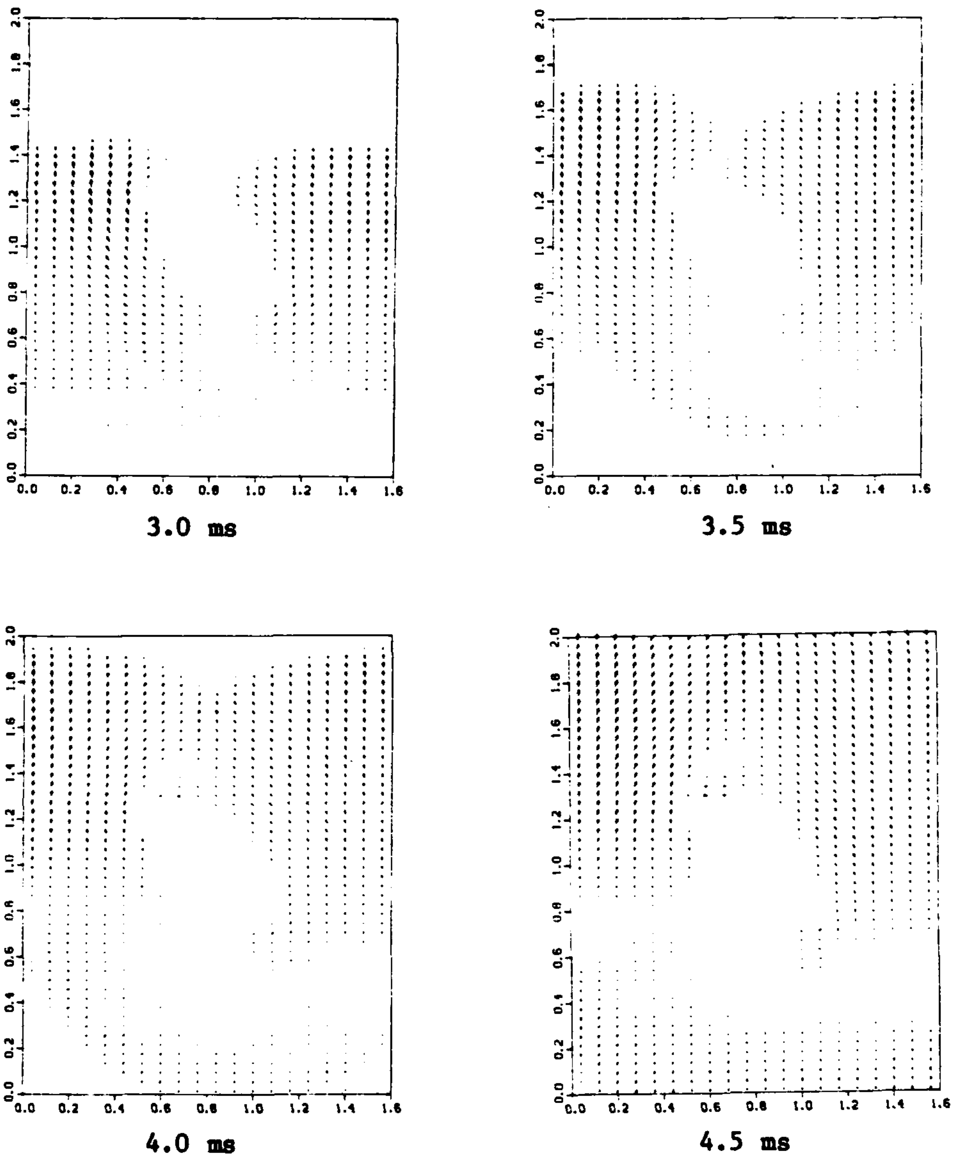


Figure 35(b). (Cont'd)
Velocity Vectors
Elliptic Body Rotated 45°
P_{max} = 20 psi

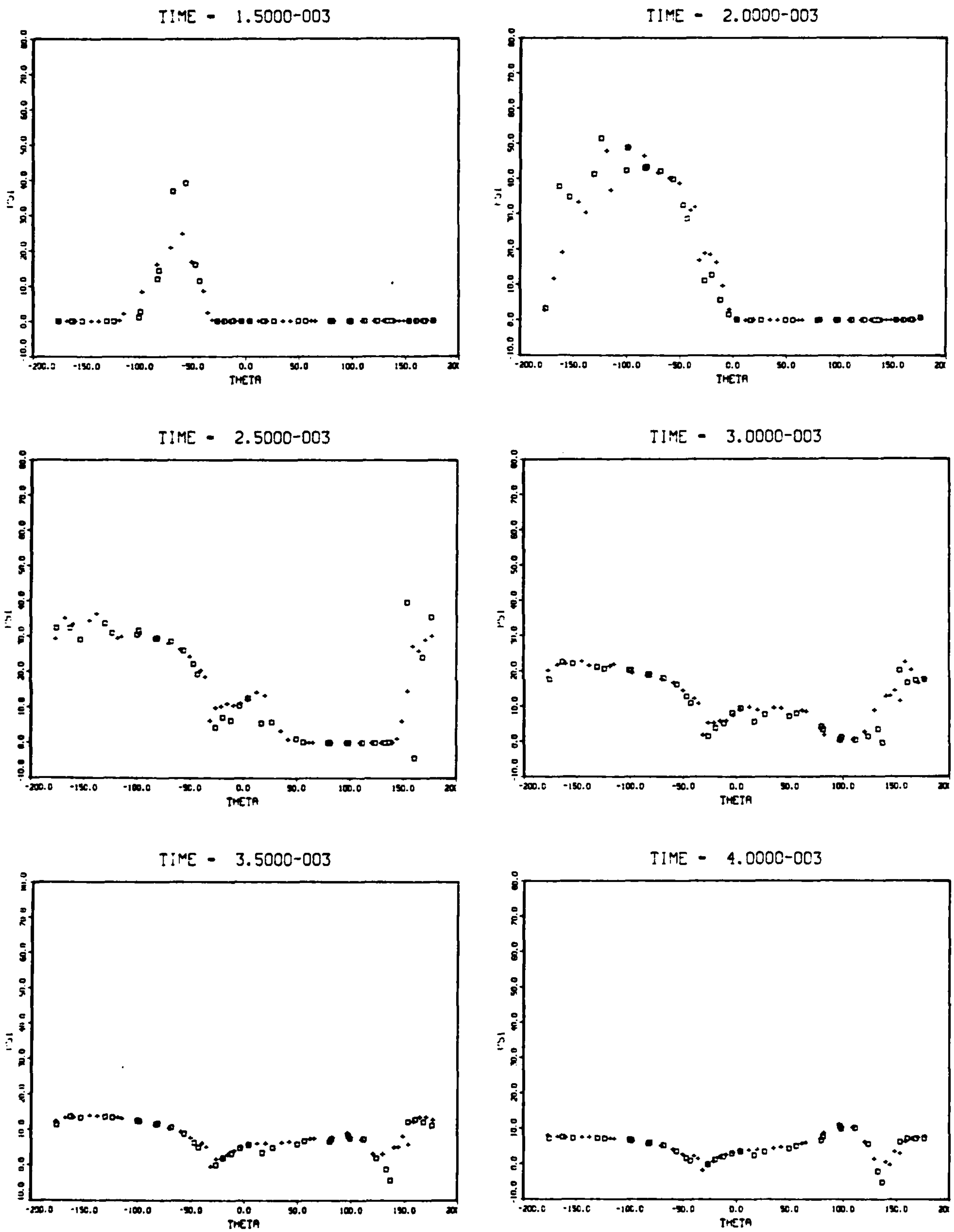


Figure 35(c)
Pressure Load Distribution
Elliptic Body Rotated 45°
P_{max} = 20 psi

configurations should be taken into consideration so that changes to the torso design are made before fabrication of the model.

For planning purposes the expected time frame for testing now appears to be scheduled for the second quarter FY82.

PROTOCOL FOR EXPOSING A MODEL OF THE UPPER TORSO TO SHOCK WAVES

1. OBJECTIVE

The objective of this test procedure is to describe the procedures required to determine the effects of shock waves on a model of the human upper torso. The requirement for testing is called out in the Work Statement of Contract #DAMD 17-81-C-0104 by the Walter Reed Army Institute of Research.

2. BACKGROUND

Results of the US Army Operational Test and Evaluation Agency evaluation of the M198 howitzer at Ft. Sill in July-December 1975 indicated that crew and test personnel experienced headaches and general distress by being in the immediate area of the howitzer when the M203 charge was used.

In 1977 the Surgeon General of the Army was requested to examine the blast effects of the M198 and other weapons. In the course of that investigation the US Army Aeromedical Research Laboratory found that the pressure levels exceeded the maximum allowed by Mil. Std. 1474A for humans, and sheep exposure to the shock tube with similar pressures at Lovelace Research Institute showed apparent lung damage.

To better quantify the effects, detailed mappings of the weapon pressure fields were made in May, 1979. In October 1979 a pilot sheep study was conducted at Aberdeen Proving Grounds that indicated possible lung injury. In July and August 1980 a detailed sheep study was carried out at Aberdeen that indicated acute lung and gastro-intestinal injury at 15-17 psi, but led to no definite conclusion for exposures in the 2-4 psi range.

JAYCOR has been tasked to initiate an analytical biomechanical model to help guide and interpret exploratory laboratory tests with animals, to estimate the damage risk criteria for humans, and to assist the search for noninvasive procedures. The blast wave loading on a body involves multidimensional flow around solid boundaries. In order to validate the results of the computer simulation of the blast interactions on a body, a series of model tests will be conducted to determine the flow of the blast wave about the body.

3. EQUIPMENT AND FACILITIES

The torso model (Figures 1 and 2) will be fabricated by JAYCOR's San Diego laboratory. More discussion as to dimensions are discussed in Section III - Pre Test Preparation.

The facilities, instrumentation and test personnel of the Lovelace Inhalation and Toxicology Research Institute at Kirtland AFB, Albuquerque, New Mexico will be used to carry out the tests.

SECTION II
TEST PROCEDURES

4. GENERAL

Two (2) models will be delivered to Lovelace at Kirtland AFB for testing. Following mutual agreement on the selected transducers, the transducer holes and threading will be accomplished by JAYCOR.

A series of shockwaves will be generated by either bare charges or from a shock tube and allowed to impact against the model. The model will be rotated in 30° increments (0°, 30°, 60°, 90°, 120°, 150°, 180°), see Figure 3, with surface pressure distributions determined at each orientation.

The peak pressures of the blast waves to be used are 25, 10, 5 and 3 psi as measured with a pressure transducer not mounted on the model. The pressure time histories of the shots should be similar to those found in the M198 howitzer firings with a fast rise time and an A-duration of approximately 5 ms when in the 3-10 psi range. With 25 psi it is expected that tne A-duration will be longer. A minimum of 28 shots (4 pressures and 7 orientations) are required.

5. INSTRUMENTATION

Seven transducers and their read out instruments will be provided by Lovelace. The accuracy of the instruments should be able to resolve the time-of-arrival differential among different pressure transducers on the torso model.

6. CALIBRATION

The transducers should be calibrated against each other to verify the information on rise time and sensitivity provided by the vender. This can be achieved by exposing all the pressure transducers, in an array, to the same shock wave.

7. EFFECT OF SURFACE MATERIAL

Mole skin is used to wrap the model in order to simulate human skin characteristics (See Section III Pre-Test Preparation). The pressure response under the skin tissue is expected to be different from that on the torso

surface. In order to see such an effect, one shot at a peak pressure of 5 psi will be tested before the model is wrapped with the mole skin.

8. METEOROLOGICAL DATA

Before each shot the ambient pressure, temperature, wind velocity and direction (if test is conducted in open field) should be recorded.

9. SHOT SCHEDULE

Round No.	Peak Pressure (psi)	Orientation
1	3	0°
2	3	30°
3	3	60°
4	3	90°
5	3	120°
6	3	150°
7	3	180°
8	5	180°
9	5	150°
10	5	120°
11	5	90°
12	5	90°
13	5	30°
14	5	0°
15	10	0°
16	10	30°
17	10	60°
18	10	90°
19	10	120°
20	10	150°
21	10	180°
22	25	180°
23	25	150°
24	25	120°
25	25	90°
26	25	60°
27	25	30°
28	25	0°

SECTION III
PRE-TEST PREPARATION

10. TORSO MODEL

The torso model will be built at the JAYCOR San Diego Facility. Although only one model is required for the test, JAYCOR will build two identical models so that one will serve as a spare.

The model will consist of a torso cylinder, two arm cylinders and two end plates. The torso cylinder will be composed of two semicircular sections located at the two sides adjacent to the arm cylinders and two flat sections at the middle of the front and back side. (See Figure 1.) This torso cylinder will be made of aluminum of 0.5 inch thick. The arm cylinders will be circular in cross section. The arm cylinders and the end plates will be made of aluminum or wood, whichever material is economical. The torso cylinder and the arm cylinders will be wrapped with mole skin to simulate roughly human skin characteristics. The end plates are attached to the cylinders by screws, so that they can be easily taken apart for transducer installation and services. A hole (with a 3 inch diameter) in the middle of the bottom end plate provides the passage of the connecting wires of the transducers.

Seven transducers will be used in measuring the pressure distribution at the middle girdle of the torso cylinder. Because of the symmetry of the model, all the transducers will be placed on one side of the torso cylinder. (See Figure 2.) The transducers and their wiring will be provided by Lovelace. To our knowledge, the Susquehanna ST-2 transducer has a pressure range 1 to 100 psi and is appropriate for the present test. When this transducer is agreed upon by Lovelace, JAYCOR will prepare the threaded holes (hole diameter: 3/4 inch; thread density: 16 threads/inch) for transducer installation.

The dimensions of the model are as follows:

$h = 48$ inch

$d_1 = 13.5$ inch

$d_2 = 10.0$ inch

$d_3 = d_1 - d_2 = 3.5$ inch

$d_4 = 4.5$ inch

$d_5 = 0.5$ inch

$l_1 = 36$ inch

$l_2 = 18$ inch   only one bottom plate is required for mounting

A table of soldier sizes from Military Standard 1472 is reproduced in Figure 4. As shown, the chest breadth and chest depth of the 95 percentile ground troops are approximately equal to our d_1 and d_2 values, respectively. Our d_4 value gives an arm circumference of 14 inches which matches closely to average of bicep and forearm circumferences of the 95th percentile ground troops. The d_5 is chosen by rough estimate.

The height of the model, h, is chosen in such a way so that the model is free from end effects and short enough for easy handling. The dimensions of the end plate are chosen by convenience. An error within 0.5 inch for all the dimensions are considered acceptable.

11. TEST SETUP

Since the blast wave near the end of the shock tube is a good approximation to a plane wave, a test at that location is preferable. In this case, the torso model should be placed vertically to guarantee normal incidence of the blast wave on the model. The model should be supported by a stand, or by other means, so that the center of the model is near the centroid of the shock tube to reduce any possible end effect. The orientation of the model should be changeable to facilitate the seven rotations mentioned in Section II, Test Procedure.

The test with the shock tube may be expensive and Lovelace may choose to conduct the test with open charge. In that case, the charge should be sufficiently far away from the torso model (> 10 d_1) so that the wave front at the vicinity of the model can be approximated by a plane wave. Assuming the model

is set up vertically, the charge should be located at the same height as the center of the torso model.

All equipment of the setup (other than the torso model) such as the stand, charge, etc, are to be provided by Lovelace.

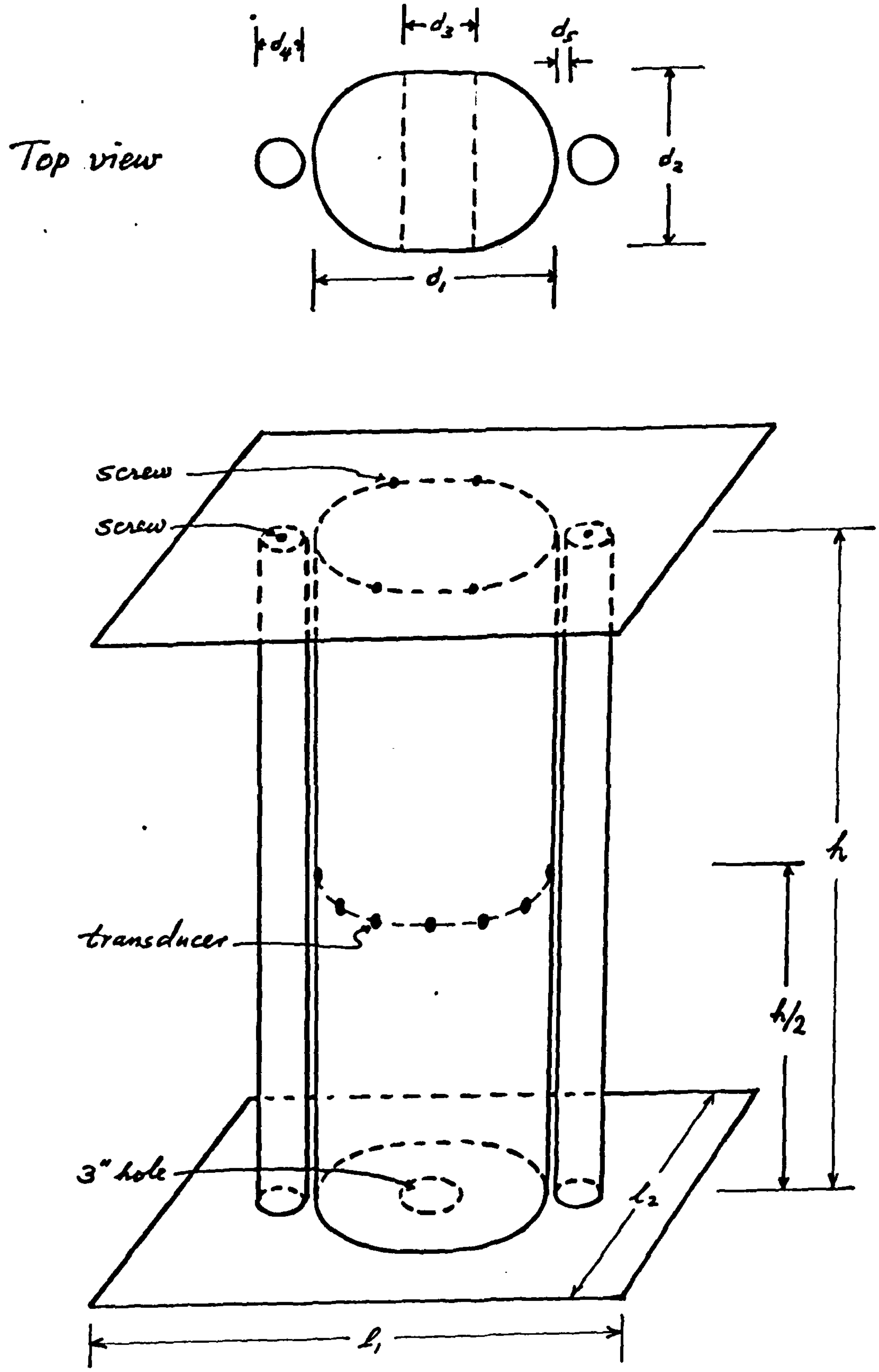


Figure P-1

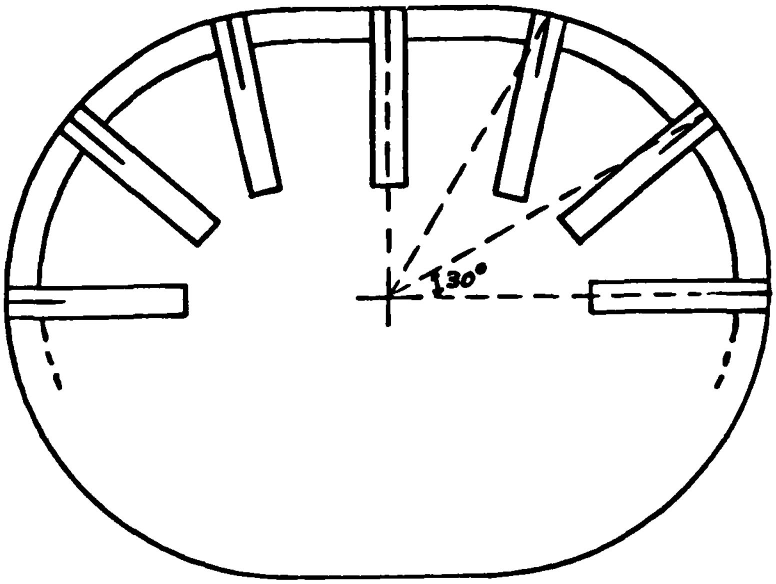


Figure P-2

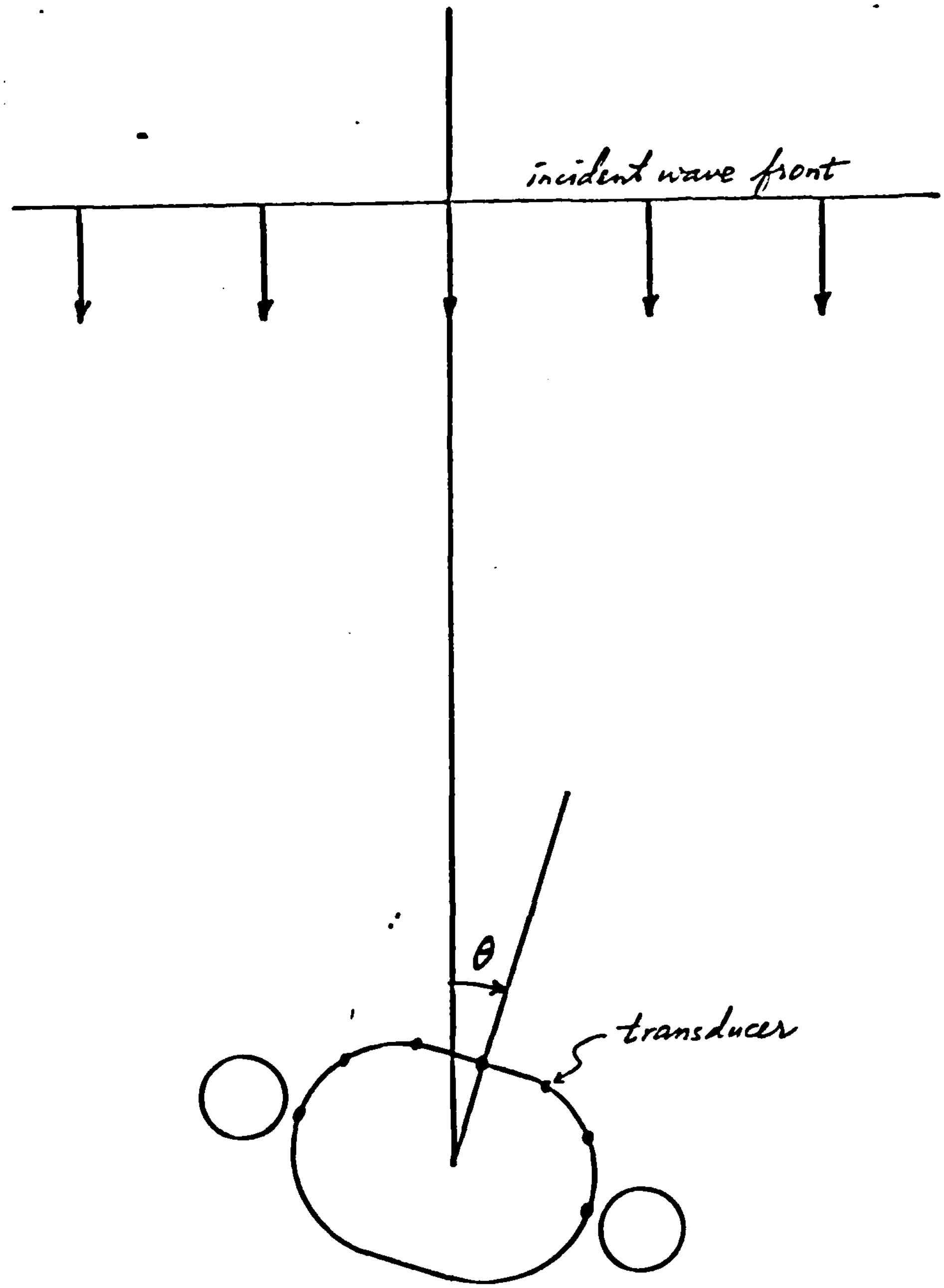
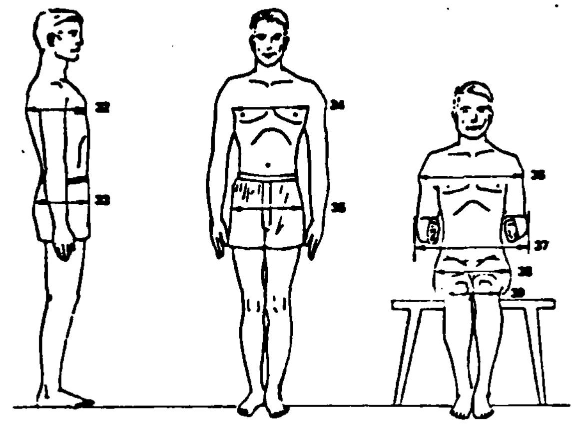


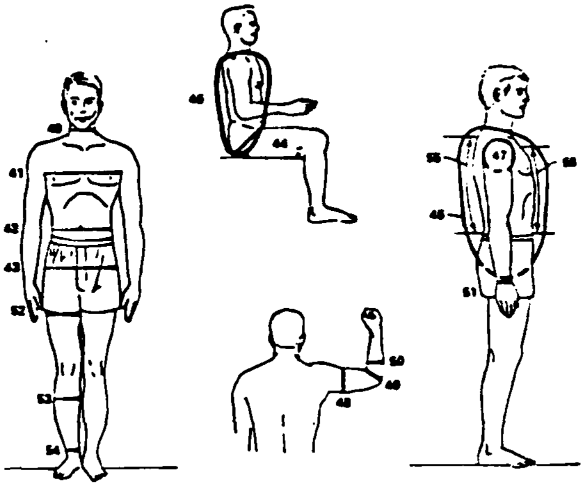
Figure P-3



MIL-STD-1472 | *NATICK/TR-77/024

	GROUND TROOPS (5th)	AVIATORS (5th)	WOMEN* (5th)	GROUND TROOPS (95th)	AVIATORS (95th)	WOMEN* (95th)
	PERCENTILE VALUES IN INCHES					
	5th PERCENTILE			95th PERCENTILE		
DEPTH AND BREADTH DIMENSIONS						
32 CHEST DEPTH	8.0	8.0	7.7	10.5	11.0	10.6
33 BUTTOCK DEPTH		8.2			10.8	
34 CHEST BREADTH	10.8	11.6	10.0	13.6	15.1	12.4
35 HIP BREADTH STANDING	11.9	12.5		14.5	15.3	
36 SHOULDER (BIDELTOID) BREADTH	16.3	17.0	15.1	19.6	20.7	18.0
37 FOREARM-FOREARM BREADTH	15.7	19.0		21.1	23.9	*
38 HIP BREADTH, SITTING	12.1	13.1		16.1	16.7	
39 KNEE-TO-KNEE BREADTH		7.5			10.0	
	PERCENTILE VALUES IN CENTIMETERS					
DEPTH AND BREADTH DIMENSIONS						
32 CHEST DEPTH	20.2	20.4	19.6	26.7	27.9	26.8
33 BUTTOCK DEPTH		20.7			27.4	
34 CHEST BREADTH	27.3	29.5	25.4	34.4	38.5	31.4
35 HIP BREADTH, STANDING	30.2	31.7		36.7	38.8	
36 SHOULDER (BIDELTOID) BREADTH	41.5	43.2	38.4	49.8	52.6	45.7
37 FOREARM-FOREARM BREADTH	39.8	48.2		53.6	60.7	
38 HIP BREADTH, SITTING	30.7	33.3		38.4	42.4	
39 KNEE-TO-KNEE BREADTH		19.1			25.5	

FIGURE 25.B.3 DEPTH AND BREADTH DIMENSIONS



MIL-STD-1472 | *NATICK/TR-77/024

	GROUND TROOPS (5th)	AVIATORS (5th)	WOMEN* (5th)	GROUND TROOPS (95th)	AVIATORS (95th)	WOMEN* (95th)
	PERCENTILE VALUES IN INCHES					
	5th PERCENTILE			95th PERCENTILE		
CIRCUMFERENCES						
40 NECK CIRCUMFERENCE	13.5	13.6	11.8	16.1	16.4	13.8
41 CHEST CIRCUMFERENCE*	33.1	34.4	30.8	41.7	43.3	39.0
42 WAIST CIRCUMFERENCE	27.4	28.9	24.3	37.8	40.0	32.9
43 HIP CIRCUMFERENCE	33.5	34.3	33.7	41.5	42.7	41.8
44 HIP CIRCUMFERENCE, SITTING		38.2			47.0	
45 VERTICAL TRUNK CIRCUMFERENCE STANDING	60.3	61.6	56.0	70.3	71.6	65.4
46 VERTICAL TRUNK CIRCUMFERENCE SITTING		59.2			68.9	
47 ARM SCYE CIRCUMFERENCE	15.6	15.7	13.3	19.8	20.9	16.4
48 BICEPS CIRCUMFERENCE, FLEXED	11.0	11.0	9.1	14.6	14.5	12.1
49 ELBOW CIRCUMFERENCE, FLEXED		11.2	9.2		13.5	11.3
50 FOREARM CIRCUMFERENCE, FLEXED	10.3	10.4	8.7	13.0	13.0	10.7
51 WRIST CIRCUMFERENCE	6.2	6.0	5.4	7.3	7.6	6.2
52 UPPER THIGH CIRCUMFERENCE	18.9	18.5	19.4	25.1	26.3	25.4
53 CALF CIRCUMFERENCE	12.8	13.1	12.2	16.2	16.3	15.5
54 ANKLE CIRCUMFERENCE	8.1	7.9	7.4	9.9	9.7	9.0
56 WAIST BACK LENGTH	16.4	16.7	14.5	20.0	20.0	17.9
56 WAIST FRONT LENGTH		14.1	12.9		17.4	16.3
	PERCENTILE VALUES IN CENTIMETERS					
CIRCUMFERENCES						
40 NECK CIRCUMFERENCE	34.2	34.6	29.9	41.0	41.6	35.0
41 CHEST CIRCUMFERENCE*	84.1	87.5	78.4	105.9	109.9	99.0
42 WAIST CIRCUMFERENCE	69.7	73.5	61.7	95.9	101.7	83.5
43 HIP CIRCUMFERENCE	85.1	87.1	85.5	105.5	108.4	106.1
44 HIP CIRCUMFERENCE, SITTING		97.0			119.2	
45 VERTICAL TRUNK CIRCUMFERENCE STANDING	150.6	156.3	142.2	178.6	181.9	166.1
46 VERITICAL TRUNK CIRCUMFERENCE, SITTING		150.4			175.0	
47 ARM SCYE CIRCUMFERENCE	39.6	39.9	33.8	50.3	53.0	41.7
48 BICEPS CIRCUMFERENCE, FLEXED	28.0	27.9	23.2	37.0	37.0	30.7
49 ELBOW CIRCUMFERENCE, FLEXED		28.6	23.5		34.2	28.9
50 FOREARM CIRCUMFERENCE, FLEXED	26.1	26.3	22.2	33.1	33.1	27.1
51 WRIST CIRCUMFERENCE	15.7	15.3	13.6	18.6	19.2	15.9
52 UPPER THIGH CIRCUMFERENCE	48.1	46.6	49.4	63.8	66.9	64.5
53 CALF CIRCUMFERENCE	32.4	33.3	31.0	41.2	41.7	39.3
54 ANKLE CIRCUMFERENCE	20.5	20.0	18.7	25.2	24.6	22.9
56 WAIST BACK LENGTH	39.2	42.4	36.7	50.8	50.9	45.4
56 WAIST FRONT LENGTH		35.7	32.8		44.2	41.4

*BUST CIRCUMFERENCE FOR WOMEN

FIGURE 25.B.4 CIRCUMFERENCE AND SURFACE DIMENSIONS

Figure P-4

4. SURVEY OF BIOMECHANICAL MODELING

4.1 LITERATURE SEARCH

In order to properly evaluate the state-of-the-art in modeling of the pulmonary system, a literature search was initiated to identify the following areas:

- Markers for lung injury.
- Key scientists who have contributed.
- Research projects that might be of assistance to Walter Reed Army Institute of Research.

The task was started utilizing the data banks of NTIS, BIOSIS and NASA. The search initially looked for lung and chest models and associated experimental data. Of this first search (Search I) we found the following citations:

NTIS	62 citations
BIOSIS	137
NASA	29
	228

In order to broaden the area of the pulmonary system, a second search was begun (Search II). Search II included key words that included the thorax and injuries to this organ. This effort produced the following:

MEDLINE	158 citations
NTIS	12
	170

From these literature searches, pertinent articles were ordered and reviewed. The relevant literature was then forwarded to WRAIR for analysis. The literature searches are included as Appendix A and Appendix B to this report.

The entire effort of four months of literature search and review of articles was of great assistance in identifying the state-of-the-art and the major

contributors. Many of the contributors were invited and participated in the Biomechanical Workshop (see Section 4.2).

4.2 BIOMECHANICAL WORKSHOP

In preparation for the biomechanical workshop a list of potential contributors was assembled from the literature searches mentioned in 4.1. Using the list an analysis was made as to what the attendees might contribute to the meeting. From this analysis a decision was made by WRAIR to explore the areas of finite element modeling, fluid dynamics applications to modeling, experimenta' ta from tests of frequency and intensity levels effects on the pulmonary system, shock data from animal testing, and spring-dashpot modeling.

Site selection was accomplished prior to the invitation being distributed. Due to the proximity of Albuquerque, New Mexico to Lovelace Inhalation and Toxicology Research Institute (ITRI), it was decided that Albuquerque would be well suited as the workshop site.

After some exploratory telephone calls were made to candidate invitees to the workshop, an official invitation was sent to those who indicated a definite interest in the proceedings and were willing to present their research data.

The workshop consisted of five major presentations interspersed with discussion sessions. The exchange of information was lively and carried over into the evening hours. Tape recordings and notes were taken of the entire proceedings and a synopsis report prepared. All of these materials are attached.

JAYCOR

Dear

JAYCOR is pleased to extend you an invitation to participate in our BIOMECHANICAL WORKSHOP to be held at the Classic Hotel in Albuquerque, New Mexico, December 8-9, 1980. As you have already been contacted by telephone and expressed an interest in participating, I would like to provide you some information as to background, objective and administration of the Workshop.

Walter Reed Army Institute of Research (WRAIR) is conducting a research program in the pathophysiology of blast overpressure in the crew area of military weapon systems. The possibility of nonauditory injury to soldiers who fire present or future weapon systems is of major concern to all. Exposure to overpressures much greater than those now allowed for auditory safety may well be harmless. However, there is no positive verification of nonauditory safety at higher pressure levels. One of the key areas that WRAIR feels should be addressed at the Workshop is: "Delineation of the mechanisms of impact - blast injury and identification of the critical blast and thoracic parameters which determine injuries." The enclosed paper by WRAIR of the Army's Technical Plan, particularly Annexes F,J and L will provide a more detailed insight into the biomechanical approach. As one of WRAIR's contractors, we are most hopeful that your active participation in this Workshop will assist us in our efforts to model the pulmonary system and to determine of human response to complex blast waveforms. I have also enclosed three papers by some of the Workshop participants, which should assist you to focus on the objectives for our discussions.

We expect the Workshop to commence with a "working breakfast" on Monday December 8th and conclude the technical discussions about noon on Tuesday, December 9th. For those who care to attend, the Lovelace Biomedical Laboratory will provide a tour and demonstration of their large shock tube facilities at Kirtland Air Force Base on Tuesday afternoon.

We have reserved blocks of rooms at the Classic Hotel (Telephone (505) 881-0000) for the Workshop participants for December 7 thru 9. As some may bring family members with them, please notify the hotel of your needs and identify yourself as attending the JAYCOR Workshop.

If there are sufficient guests of the participants who may desire scenic tours, we will arrange for them a visit to "Old Town" Albuquerque, the Sandia Mountain Peak Tramway overlooking the city, and if possible, a trip to a local Indian Reservation. These arrangements are flexible and can be varied to meet your guests' desires.

205 South Whiting Street • Alexandria, Virginia 22304 • (703) 823-2115

Please make your own travel arrangements to Albuquerque. For those arriving by air, there will be limousine service provided by the Classic Hotel from the airport.

JAYCOR will reimburse you for your travel and living expenses plus provide you an honorarium for your participation in this Workshop. I will discuss reimbursement procedures with you during your stay. For your presentation (15-20 minutes duration) we will have available a standard overhead vugraph projector, a 35 mm slide projector and a 16 mm motion projector with sound.

If you have any questions please call me at (703) 823-1300, Extension 274. After December 3rd you may contact me through the Classic Hotel.

Sincerely yours,

Henry C. Evans, Jr.
Program Manager
Fluid Dynamics Division

BIOMECHANICAL WORKSHOP
December 8-9, 1980
Albuquerque, New Mexico

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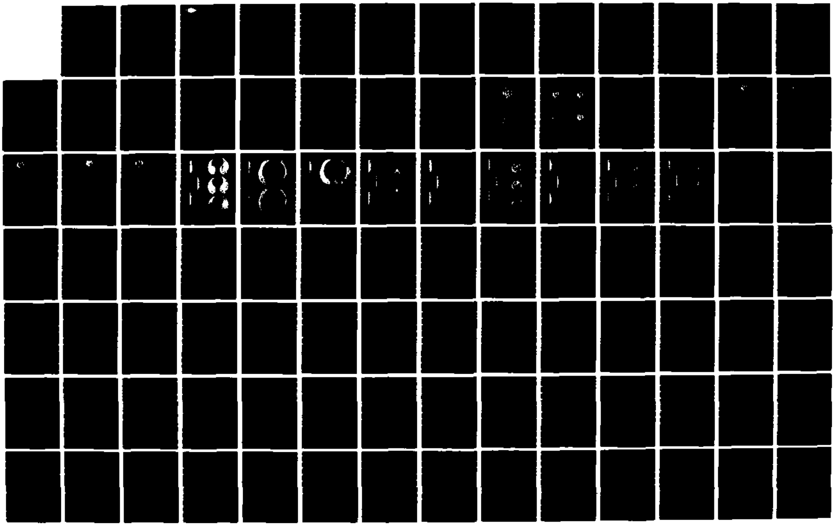
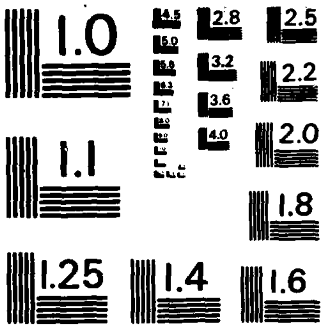
AD-A139 670 TEST PLANNING COLLECTION AND ANALYSIS OF PRESSURE DATA 3/4
RESULTING FROM WEAPON SYSTEMS(U) JAYCOR SAN DIEGO CA
J H STUHMILLER ET AL. OCT 81 JAYCOR-J520-81-007
UNCLASSIFIED DAMD17-80-C-0104 F/G 19/6 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

BIOMECHANICAL WORKSHOP
CLASSIC HOTEL
ALBUQUERQUE, NEW MEXICO
December 8-9, 1980

Date	Time	Event	Place
Dec 7	--	Hotel Registration	Classic Hotel
Dec 8	8:15	Working Breakfast	
	9:15	Administrative Announcements Dr. Stuhmiller and Mr. Evans	News II
	9:30	Overview to Blast Overpressure Program - Dr. Y. Phillips, WRAIR	News II
	10:15	Impact Studies Dr. David Viano, G.M.	News II
	10:45	Coffee Break	
	11:00	Mechanical Impact Methodology Dr. H. Von Gierke. A.F. Aerospace Medical Research Laboratory	News II
	11:30	Finite Elements for Modelling Dr. Paul Chen, TRW	News II
	12:00	Lunch	Dining Room
	1:30	Workshop Discussion	News II
	4:30	Adjourn Session I	
	5:30	Social Hour	Crown Room
	6:45	Transportation to Maria Teresa Restaurant	
	9:00	Return to Classic Hotel	
Dec 9	9:00	Workshop Session II	News II
	12:30	Closing Remarks	
	12:35	Adjourn Session II	
	12:40	Lunch	Dining Room
	1:45	Transportation to Lovelace Medical Research Lab	
	4:30	Return to Classic Hotel	

JAYCOR

December 7, 1980

Welcome to Albuquerque, the Classic Hotel and the Biomechanical Workshop. I hope that your visit here to the Southwest will be enjoyable and the Workshop stimulating.

In order to give each of you a chance to meet one another in a relaxed atmosphere, there will be a "working breakfast" Monday morning at 8:15 a.m. in the Crown Room on the ground floor. From there we will progress to NEWS II, our conference room, to commence with the Workshop. An agenda and roster of our participants have been included in your packet.

Monday evening we have planned a social hour in the Crown Room and a dinner at the famous Maria Teresa restaurant which is located on the edge of "Old Town". If you have a guest(s) whom you would like to invite to either of these functions, please let me know before lunch.

Some of you may have a guest who may want to take a tour of Albuquerque and its environs. Please let me know at breakfast so that appropriate arrangements can be made.

Once again, my thanks for participating in this project. If I may be of assistance during the Workshop, please let me know.

Henry C Evans Jr

HENRY C. EVANS, Jr.
Program Manager
Fluid Dynamics Division

P.O. Box 370 - 1401 Camino Del Mar • Del Mar, California 92014 • 714/453-6580

SYNOPSIS OF

BIOMECHANICAL WORKSHOP

December 8 and 9, 1980

Albuquerque, New Mexico

December 8, 1980

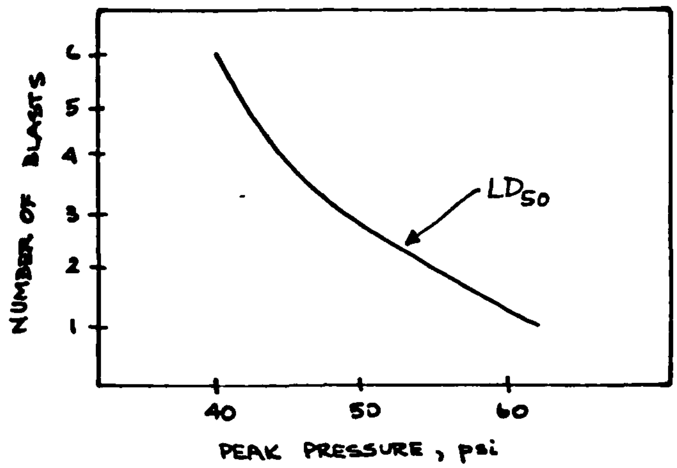
Cpt. (Maj.) Yancy Phillips, M.D. - Walter Reed Army Institute of Research

Nonauditory injury from BOP is suffered by the air-filled organs: sinus, inner ear, lung, etc. The effects of nuclear explosions (very large BOP) on animals had been described in the 1960's by Dr. Richmond's group at Lovelace.

Based on the nuclear level blast exposure experience, the following characterization of blast injury has been formed. The pathology of the injury is revealed in: (1) hemorrhage (blood entering the air passages), (2) edema (increased water in the lung and air passages), (3) emphysema (enlarging of the small air sacs), (4) lacerations, and (5) stripping of the bronchial epithelium. The injury is indicated pathophysiologically by (1) decreased pulmonary compliance, (2) increased physiological shunt, (3) increased respiration rate, (4) decreased tidal volume, (5) hypoxia, and (6) air emboli (air bubbles in the blood stream).

Mechanisms that have been put forward to explain the coupling of the BOP to the physiology include: (1) contusion due to chest wall acceleration (most of the damage is beneath the chest wall); (2) spalling effects (compression wave effects at the boundary between dissimilar materials), (3) inertial effects such as shearing, and (4) implosion effects (local over-compression of bubbles). The external physical factors that might be used as indicators of the dose strength are (1) peak pressure, (2) duration, (3) pressure impulse, (4) frequency content, and (5) number of exposures.

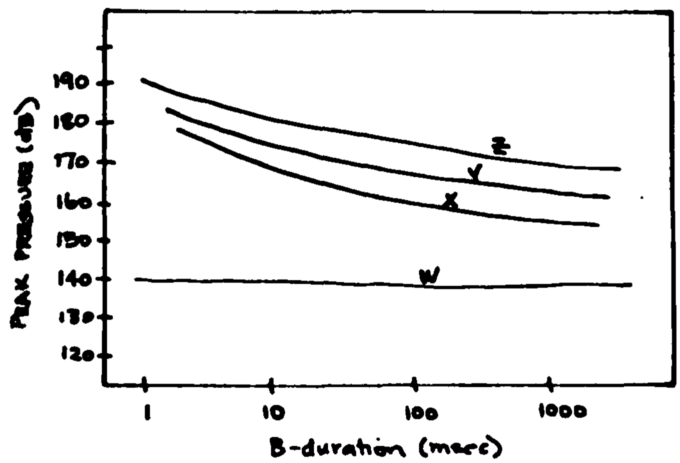
In Lovelace tests the primary cause of death was air emboli and a strong dependence on the number of exposures was shown.



In the work of Clemedson and his colleagues, increased lung weight was used as an indicator of damage. They found a strong correlation between increased lung weight and chest wall velocities exceeding 15 m/sec within 150-200 μsec. This corresponds to chest wall accelerations in excess of 10,000 g's! A second conclusion of this group is that damage can be produced by complex waves (arising from reflections in a bunker, say) and that are only 1/5 of the amplitude (peak pressure) of classic blast waves required to cause similar damage.

The BOP program will begin with simple waves, but will be extended to the more important area of complex waves caused by reflection in bunkers or vehicles.

The present design criteria is contained in MILSTD 1474. The parameters of this standard are peak pressure and B-duration (the time from the start of the wave until the amplitude is 20 dB of the peak for the last time).



Below the W-line no hearing protection is required. Various amounts of hearing protection is required up to the Z-line. No exposure above the Z-line is permitted because of possible nonauditory damage.

[Von Gierke, who was on the committee that drafted the standard, pointed out that the Z-line was only a conservative guess.]

The variance from MIL-STD-1474 by new weapons has a serious impact on the Army's function and thus the urgency of the BOP program. The M198 will be the principal field piece of the 1980-90's. Its muzzle brake redirects the blast toward the crew area and triples the BOP there. There is currently a 12-month moratorium on crew training using the high range charge. A self-propelled howitzer with a more efficient muzzle brake (20% vs. 10%) has shown Z-line crossings with zone-7 charges. [Von Gierke: data from other weapons should be collected.] [Cummings: other weapons that may exceed the Z-line are 4.2" mortar, 81mm mortar.] WRAIR will undertake field demographic data - a cross section prevalence study of pulmonary function in active duty artillerymen.

<u>Dr. David Viano</u> - General Motors, Research Laboratory

General Motors' concern is with the impact loading on the human chest - steering wheel impact during car accidents.

Principal models have lumped mass and spring concept.

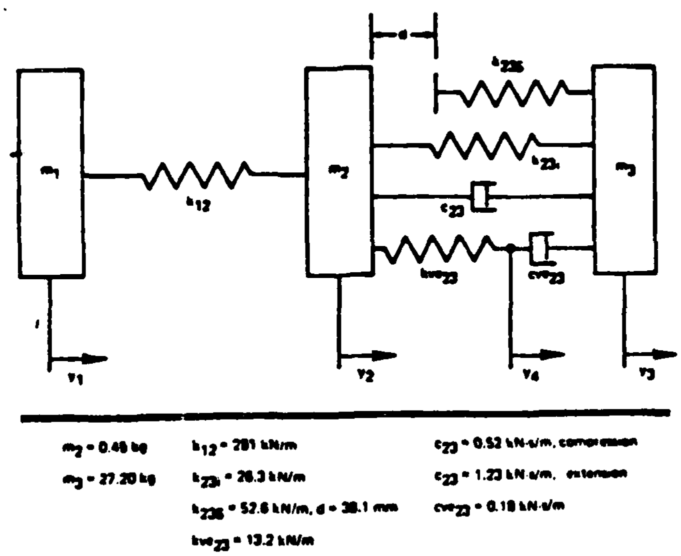


Fig. 1. Mechanical analog for the anteroposterior impact response of the human thorax. Lobdell [1].

The main test of the model is the prediction of the sternum-backbone displacement. The impact leads to chest wall compression, whole body motion, and energy dissipation. No correlation of AIS with impact momentum was found, but there was correlation with kinetic energy. It should be noted that AIS is extremely crude and subjective and is directed toward severe crushing injuries.

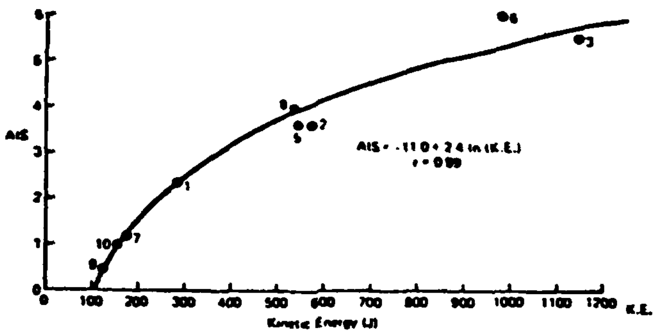


Fig. 13. Dependence of cadaver injury data on the impactor kinetic energy.

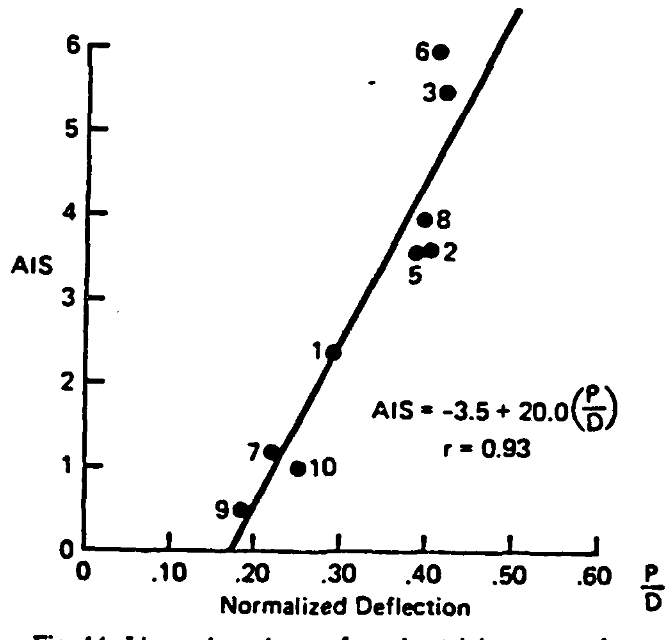
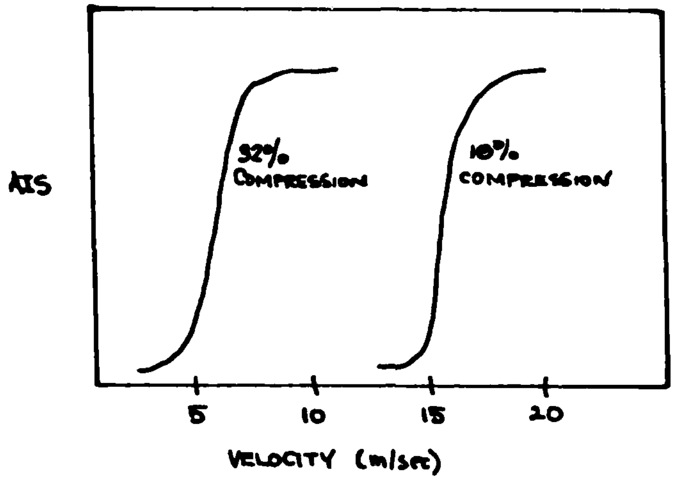
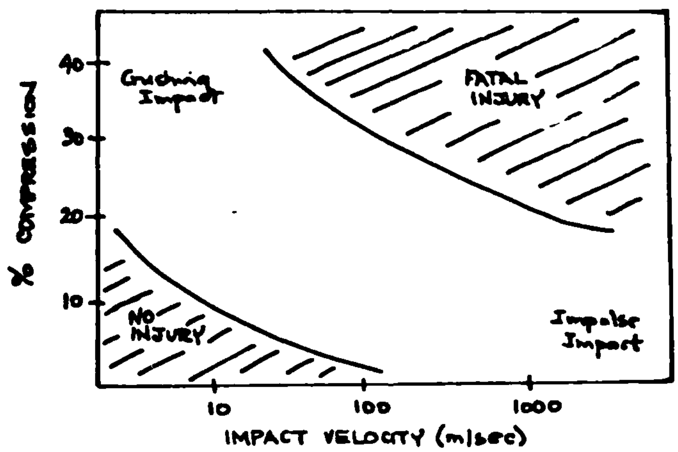


Fig. 14. Linear dependence of resultant injury on peak normalized deflection from cadaver tests.

When rib damage is removed from consideration the results indicated that visceral damage does not occur until the chest is 40% compressed. Compression also serves to regroup the velocity correlation.

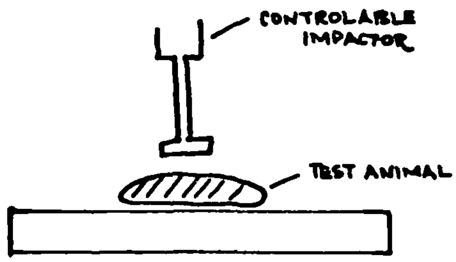


There appear to be two injury modes: crushing impact (relatively slow but large displacements) and impulse impact (small but quick displacements).



GM's feeling is that the correlation is with kinetic energy.

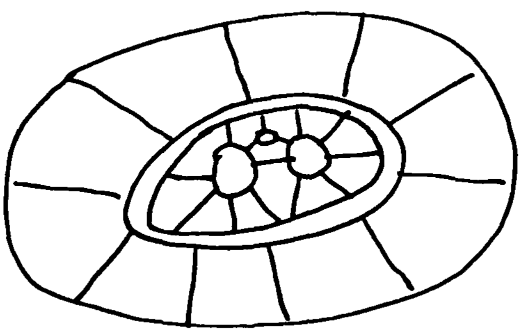
Experiments were conducted to control both impact displacement and velocity.



Two classes of lung injury were identified: (1) alveolar and (2) bronchial. Alveolar injury is associated with impulse impact; bronchial injury with crushing impact. Bronchial injury related to damage at the root of the lung. Alveolar injury is morphologically similar to blast injury.

Results of experiments with constant velocity for a fixed distance.

Latest modeling effort is directed toward a more fundamental understanding using a finite element dynamic model.

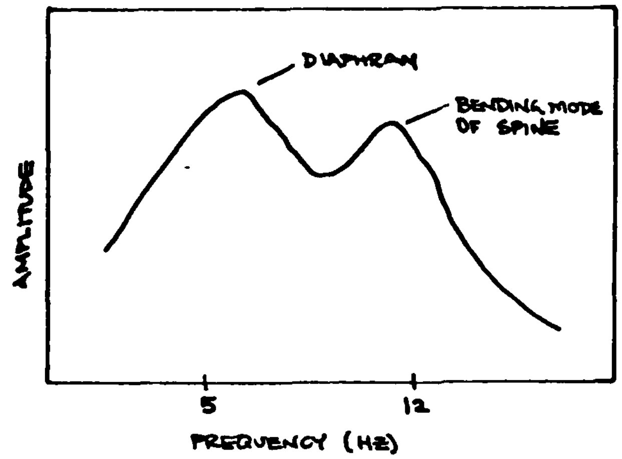


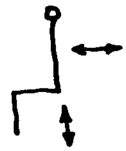
PLANAR FINITE ELEMENT MODEL

Present model is planar (two-dimensional) and treats the rib cage as a continuous loop. Some difficulties with present model for large geometric displacements, so GM is sponsoring further work with University of California, Berkeley.

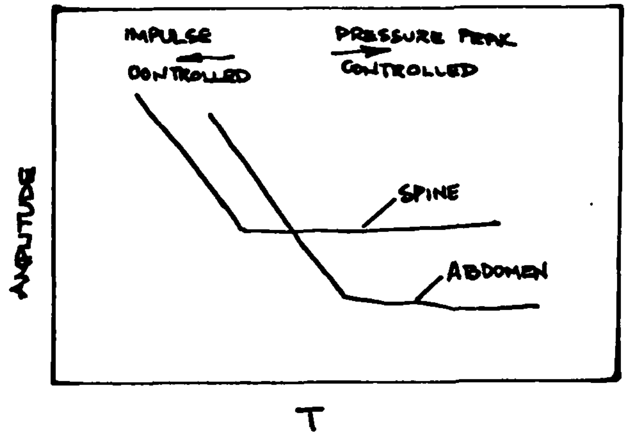
Dr. H. E. Von Gierke - Air Force Aerospace Medical Research Laboratory

The Air Force is concerned with impact to pilots during ejection from jet planes. Tests have been conducted using controlled frequency vibrations to humans in a sitting position. A modulated air stream from the mouth is observed.

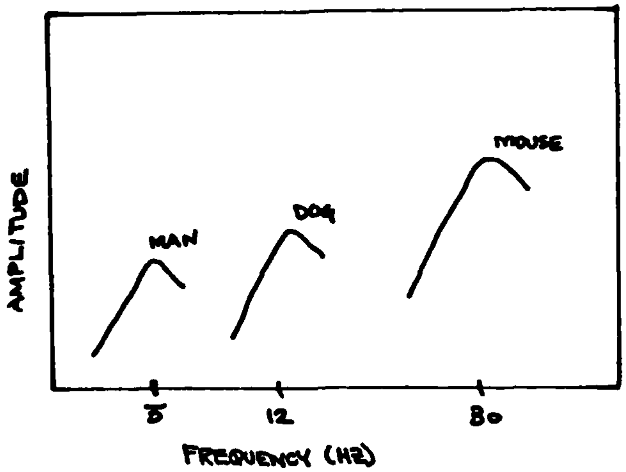




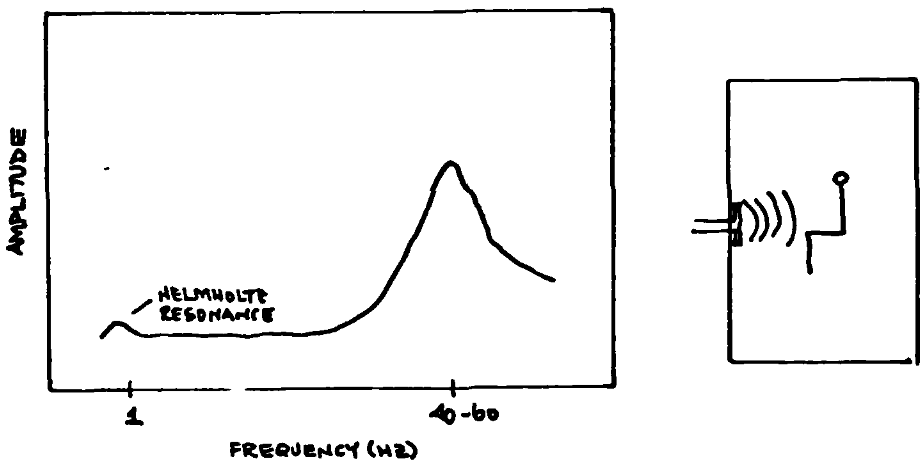
Impact loads (large, nonperiodic) show a similar response.



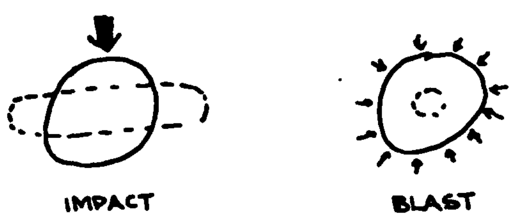
Effects of body scale on response frequency of the lower peak



The same experience has been observed with air transmitted forces: infrasound corresponds to vibration, blast waves to impulse.



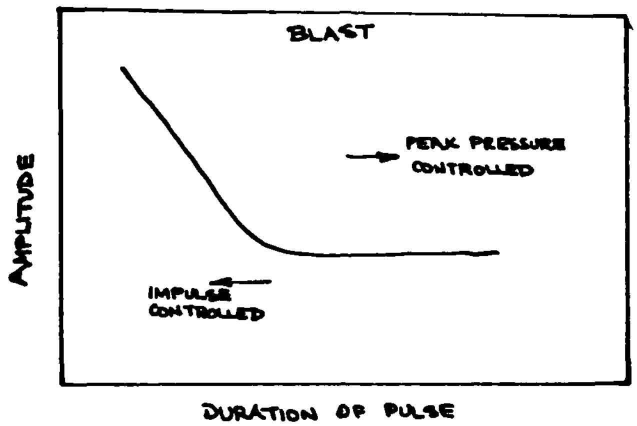
Possible important difference between impact and blast loads: impact will couple with low frequency modes, blast with high frequency modes.



Compressibility of the lung had to be included in order to explain the higher frequency resonance. The resonance at 4-6 Hz seen earlier in vibration tests does not appear here because the distribution of the load is different.

General conclusions on the nature of response and damage:

(1)



Looks similar to Lovelace lethality curves.

(2) General (nonlocal) damage will result from the low frequency part of the wave whereas local damage will result from high frequency part.

Dr. Ints Kalep - Air Force Aerospace Medical Research Laboratory

AF developed a detailed lumped mass thorax model to deal with problem of spine compression during pilot ejection. Properties of the model:

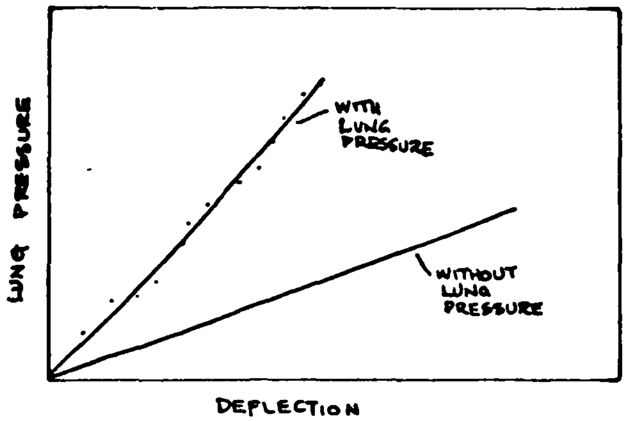
(1) lumped parameter torso model for Z-vibration and impact,

(2) transverse coupling of chest wall,

(3) nonlinear compressibility and air passage resistance,

(4) effects of blunt impact on chest wall.

Conclusions reached were that: for short-duration impacts air dynamics are not important and that rib fractures correlate best with peak chest deflection. For large chest wall deflections the resistance of the lung pressure must be included to get the observed effects.



The Air Force feels that certain model improvements are necessary: compartmentalized thoracic volume, better tracheal flow characteristics, and effective chest wall elasticity for various pressure distributions.

December 9, 1980

Dr. Paul Chen - TRW Defense and Space Systems Group

Dynamics of the human thorax. The physiological components to be modeled are superficial tissues, ligate muscles, bone structure, and internal organs. The objectives of TRW's interest are crash impact injury, auto restraint systems, and antropological dummy development and manufacturing. The problems associated with human thorax modeling are injury criteria, required complexity, and costs. The approaches considered by TRW are: (1) pathophysiological - using clinical research to determine the injury mechanism and a damage criterion; and (2) biomechanical - using a sequence of animal, cadaver, human volunteers, and anthropomorphic dummy testing coupled with analysis and interpretation using a mathematical model. The available modeling techniques are: (1) simplified lumped parameter models - easy to construct, inexpensive, model parameters are critical, and there is usually limited information available; and (2) detailed finite element model - more complex, cost more, some model parameters may still be unknown, generates detailed predictive information.

Finite Element Model. The input quantities required are: body geometry, material properties, stiffness, joint boundary, load distribution, and the energy dissipation coefficients. The model implications include: a skeletal module, viscera inclusion, physiological effects of intrathoracic pressure and muscle tension. A synthesis technique is used where a substructure of models are solved individually (nonlinear effects ignored) and then the total solution constructed from a combination of modes. The existing finite element computer codes are ADINA, SAP, and NASTRAN, but more specific codes need to be developed. The current finite element chest model used by TRW was originated at UCLA by Chen and Roberts with collaboration with Raddi and Kazemieslamia. THORAX-I: static, elastic model, high resolution (80 nodes?). THORAX-II: simplified model (~ 20 nodes).

Suggestions: (1) Injury criteria and injury mechanism study should be done in parallel; (2) use detailed finite element model that can then be simplified to determine the parameters of simpler lumped models; (3) animal models tested first, then human models; (4) a two-level model should be used with a bone thorax part and a soft tissue part; (5) first use a linear model, then include nonlinear effects.

4.3 LUMPED PARAMETER MODELS

As part of our investigation of the state of biomechanical modeling, we implemented existing lumped parameter models being used to describe thorax and abdominal motion into a computer code. In particular, we wrote a computer program to solve and graphically display the results of the Lovelace Model that has been used in nuclear-level blast interaction. This computer program was delivered to Walter Reed and put on their in-house machine to allow more rapid turnaround on answering questions relating to blast interactions. We also have maintained the computer program on the JAYCOR computer to be able to answer questions relative to possible body motion under loading.

One of the applications that has been made of the code is to compare the effects of a blast signature as measured in the field from a howitzer with the loading signature developed by the water jet impactor we are developing for Walter Reed. As an example, there was interest in knowing the effects of an after pressure following the initial pulse. This after pressure could be due to the mechanical aspects of the impactor or to the winds that follow a blast wave. The accompanying figures show a comparison between the response of the lumped parameter model scaled to the mass of a man for the cases when the incident blast wave does or does not have an after pressure part. In all cases, the after pressure was assumed to be 10% of the maximum peak pressure. The results are shown for 3, 10, 25, and 50 psi maximum peak pressure waves. The results indicate that the responses are nearly identical and that for presently accepted injury indicating quantity, chest wall velocity, there is only a 2 to 4% variation caused by the presence of an after pressure. This variation is so small that it is unlikely that the after pressure has any influence on injury.

$P_{tail} = 0$ $\qquad$ $P_{tail} = 0.3$ psi

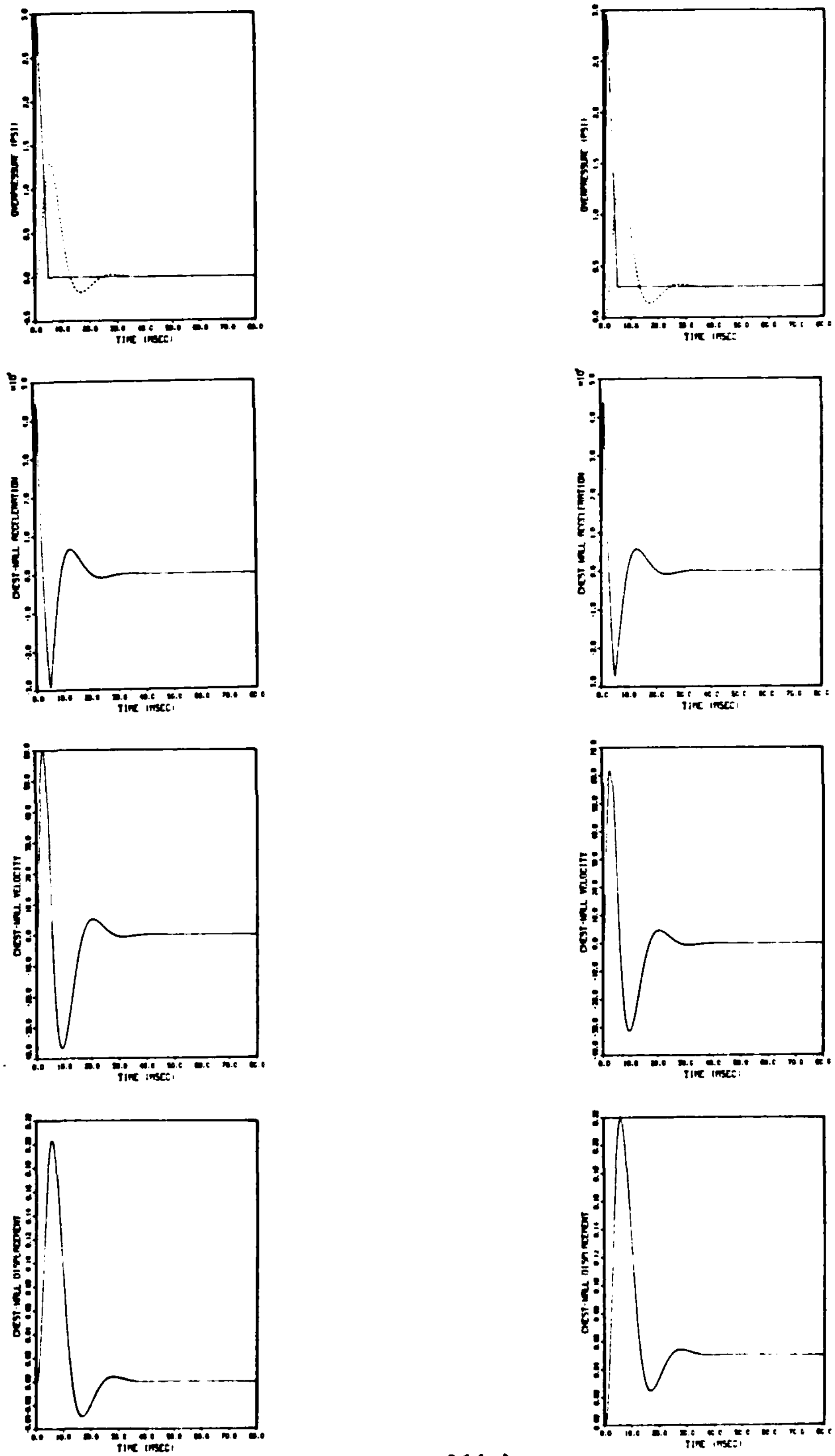


Figure 36(a)
Lumped Parameter Model
$P_{max} = 3$ psi

$P_{tail} = 0$ $\qquad$ $P_{tail} = 1$ psi

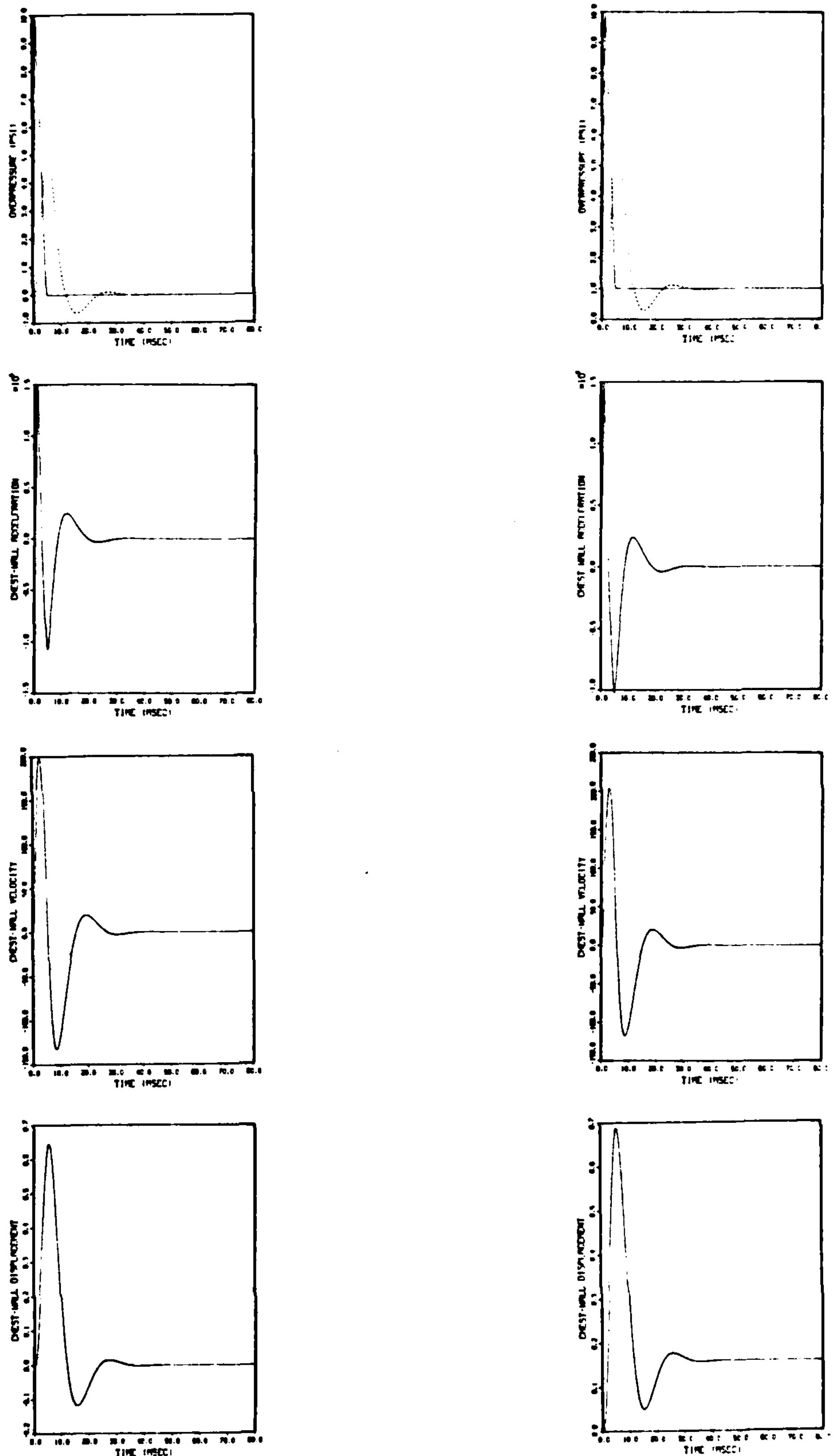


Figure 36(b)
Lumped Parameter Model
P_{max} = 10 psi

$P_{tail} = 0$ $\qquad\qquad$ $P_{tail} = 2.5$ psi

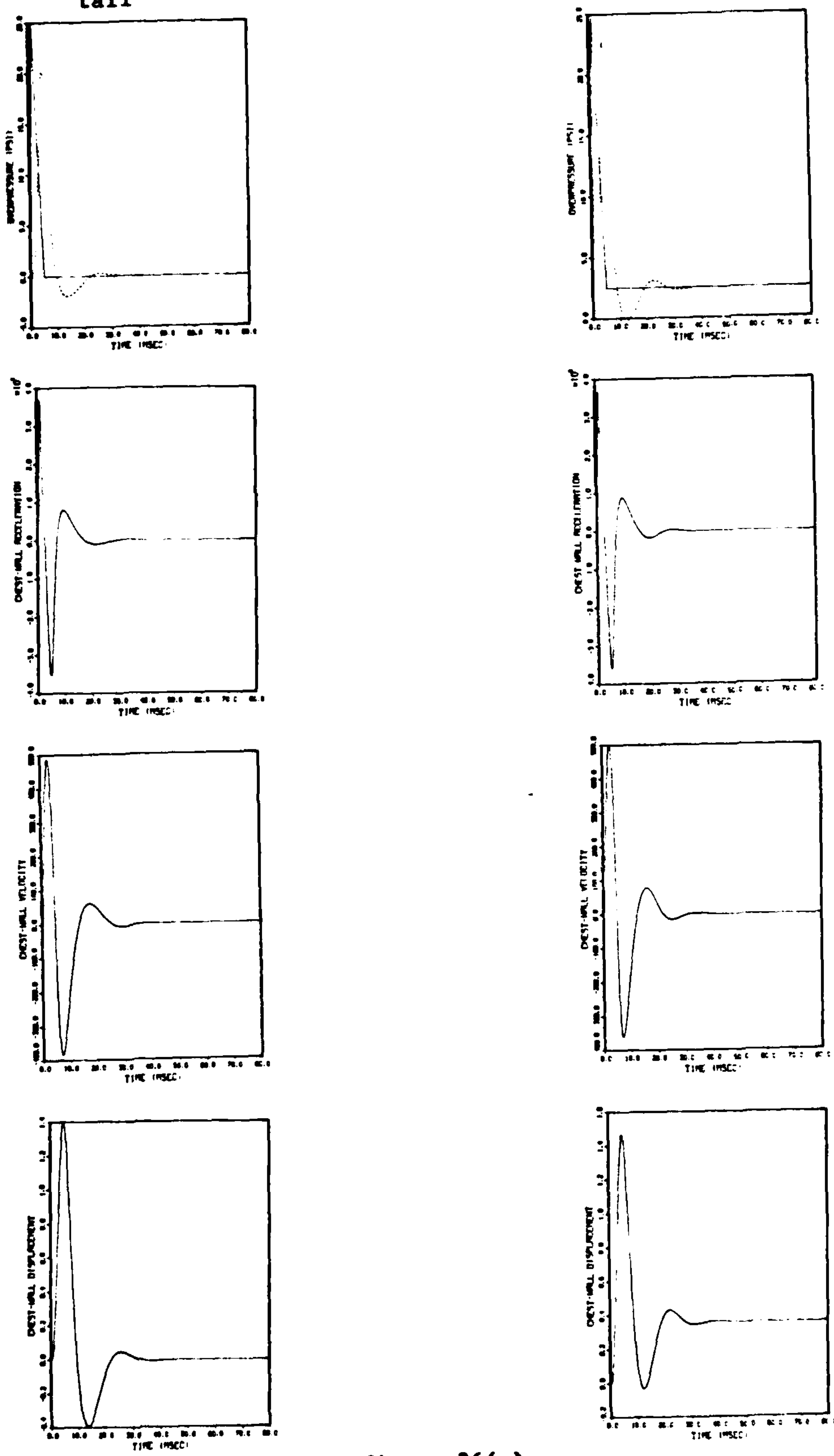


Figure 36(c)
Lumped Parameter Model
$P_{max} = 25$ psi

$P_{tail} = 0$ $\qquad$ $P_{tail} = 5$ psi

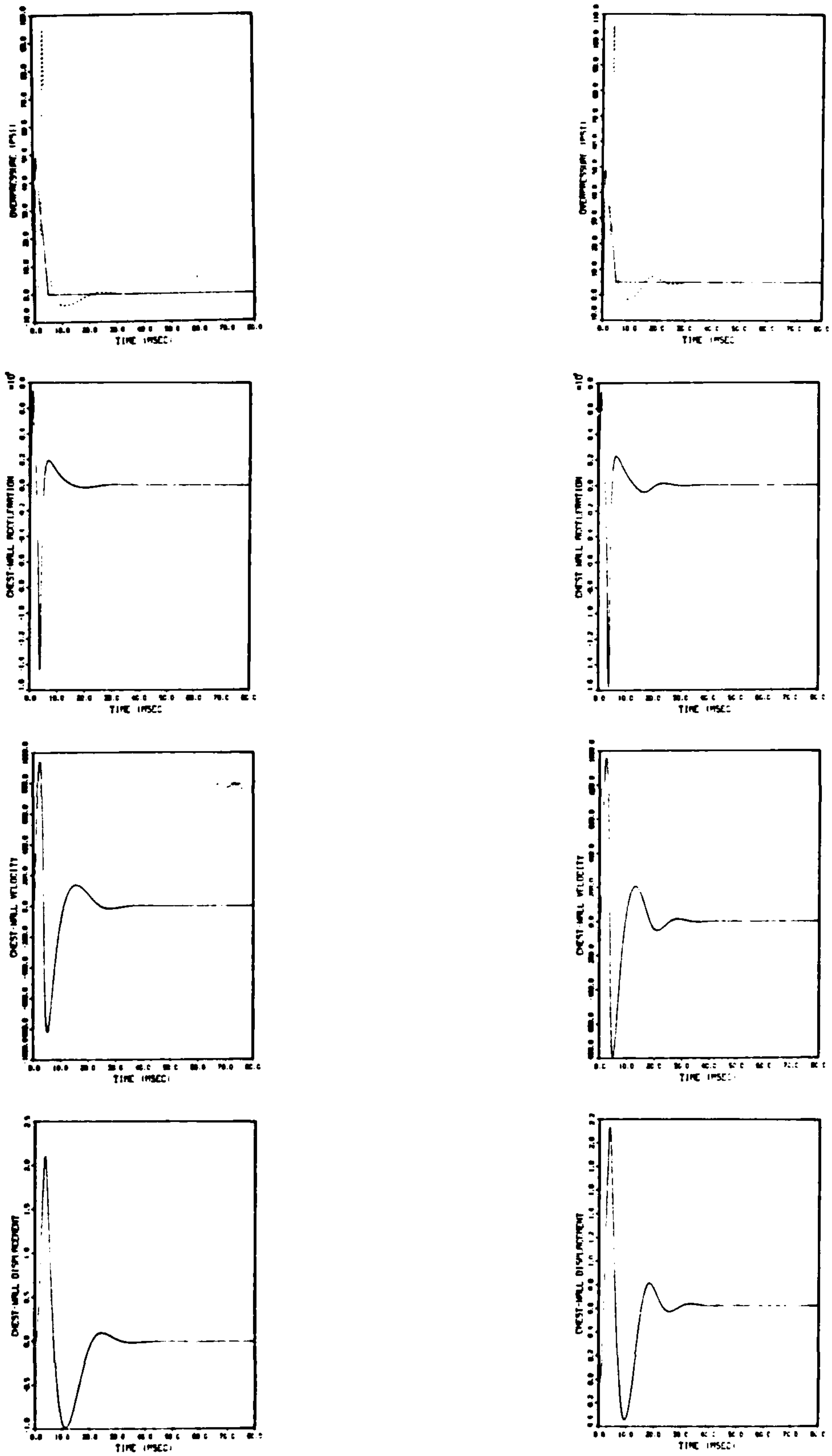


Figure 36(d)
Lumped Parameter Model
$P_{max} = 50$ psi

5. DISCRETE REPRESENTATION OF BODY

5.1 INTRODUCTION

The Finite Element Method (FEM) has been used extensively in different physical and engineering fields. For problems involving irregular geometry, boundary conditions, prescribed loadings, as well as complex material properties FEM analysis furnishes approximate solutions to the physical field problems with satisfactory accuracy.

We have begun to study the lung injury mechanism during airblast overpressure by the FEM technique. By assuming linear material with small deformation, a two-dimensional plane strain discretization model accounting for the composite materials and complex structure of human thorax cross section is used. At this stage, static analysis has been made to study the deformation and stress distributions of the structure model when a static pressure (50 psi or 5 psi) is applied on the frontal chest wall, side wall, or back wall of the thorax. Transient analysis of the model response during and following 5 msec of step pressure loading (5 psi) on the front chest wall is also being studied.

The purpose of the current task is the construction of a plane strain two-dimensional FEM model and the investigation of structure deformations (static and transient) resulting from prescribed external pressure loadings. This is only the initial phase of the whole study. The objective will be the construction of a continuum model which not only confirms the measurable experimental data from various types of field study but also makes clear definite risk criteria judgement. To accomplish this the propagation of blast waves in different parts of the body, the scattering and diffraction of the elastic waves through different media, and how tissue is damaged when the resultant stress reaches the ultimate strength are to be studied with the aid of the FEM model.

DESCRIPTION

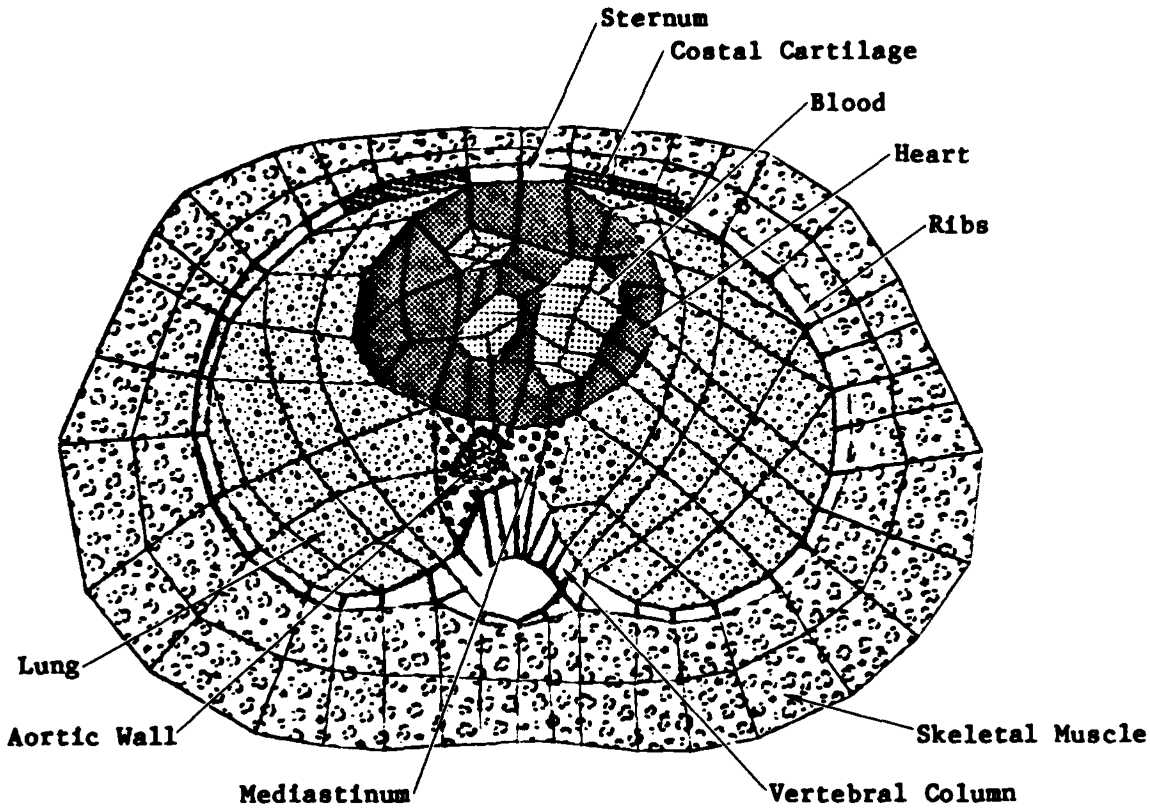
The assumptions used in this analysis are summarized as follows:

(1) 2D Model of the Thorax - Based on the cross section of a human trunk at the level of the aortic semilunar valve a 2D plane strain model of the thorax is constructed. Physiologically, the pleural space will allow relatively free sliding motion between lungs and chest wall, diaphragm, as well as other organs. For simplicity, it is assumed that there is no relative motion between surfaces of different organs during any given loading and deformation process. In other words, a displacement compatible model is used. The FEM mesh discretization is shown in Figure 37(a) and 37(b). The rib cage is modeled as a closed ring along with costal cartilage and sternum in model A. In model B, the rib is modeled as segmental with skeletal muscle filling the space between to account for the average properties and roles of a rib cage structure.

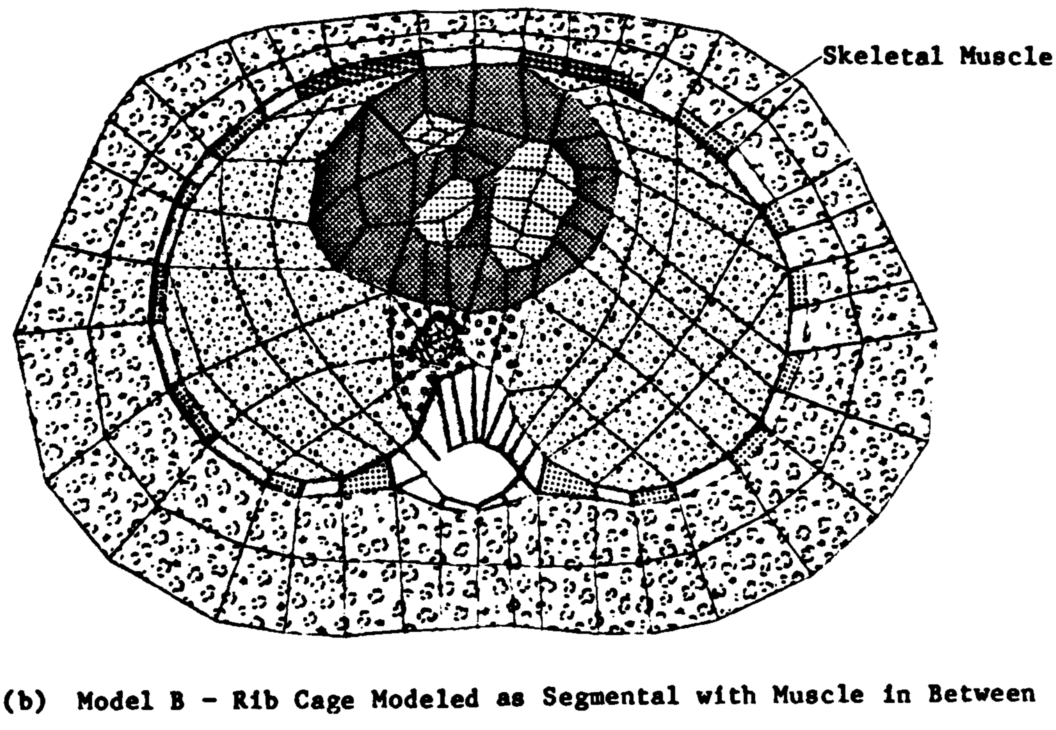
(2) Linear Analysis - It is a well known fact that most of the biological soft tissues are nonlinear viscoelastic. For nonlinear material under finite deformation the analysis is extremely involved and complicated. While a nonlinear three-dimensional analysis is possible, a linear approach is used at the present stage for the sake of simplicity.

(3) Material Properties - For this linear analysis, Hookean type material constants are used. For the lung parenchyma and the aortic vessel wall they are taken from Radford (1957) and Bergel (1972), respectively. For the rest of the materials the moduli constants are approximated from stress-strain curves collected in Yamada (1970). G, K, E and ν denote shear moduli, bulk moduli, Young's moduli and Poisson ratios, respectively. The magnitudes of densities are chosen arbitrarily in this analysis with 2.67×10^3 Newton-sec^2/m^4 for all the tissues except the lung where 20% of the above number is used since the purpose is to study the role of densities difference in inertia terms. Table 9 summarizes the material property constants used.

(4) FEAP Code - The FEAP code (Finite Element Analysis Program) developed by R. L. Taylor of the University of California at Berkeley is used to perform the present analysis. FEAP is a versatile general purpose FEM program with emphasis on its capability on contact-impact problems.



(a) Model A - Rib Cage Modeled as a Closed Ring with Costal Cartilage



(b) Model B - Rib Cage Modeled as Segmental with Muscle in Between

Figure 37. Two Dimensional Plane Strain FEM Mesh Discretization Shown with Different Material Zones.

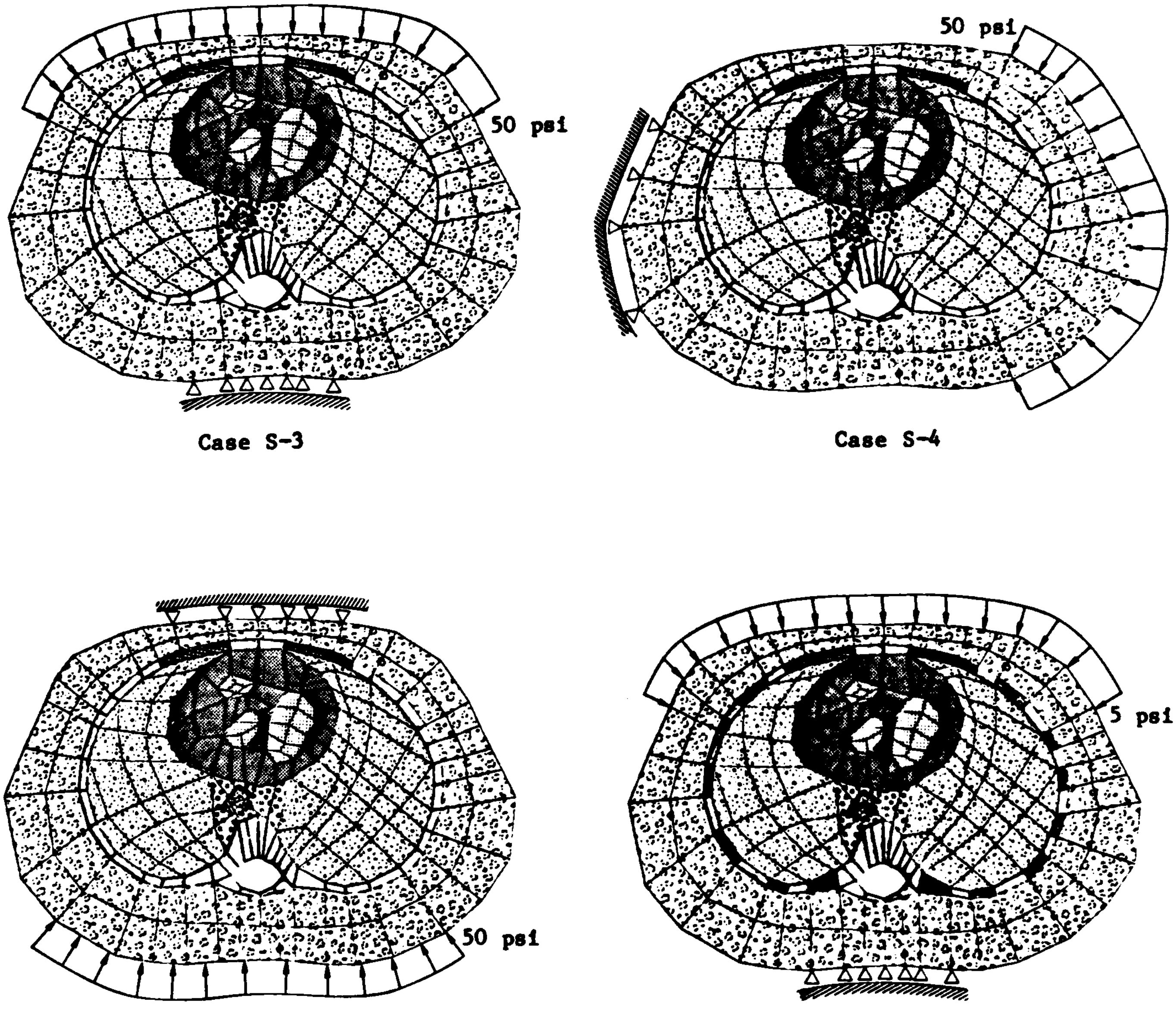


Figure 37(c). Cases S-3, S-4, and S-5 are Three Different Loading Cases on Model A as Indicated. Case S-6 is the case with 5 psi of front chest loading on Model B.

Table 9. Material Property Constants

Tissues	Shear Modulus, G (Newton/m^2)	Bulk Modulus, K (Newton/m^2)	Young's Modulus, E (Newton/m^2)	Poisson Ratio, ν	Density Estimated ρ (Newton-sec^2/m^4)
Skeletal muscle	1.1×10^5	1.1×10^6	3.3×10^5	0.449	2.67×10^3
Rib (bone)	5.0×10^9	1.1×10^{10}	1.3×10^{10}	0.301	2.67×10^3
Costal cartilage	1.6×10^8	7.5×10^8	4.5×10^8	0.400	2.67×10^3
Heart	7.2×10^4	7.0×10^5	2.1×10^5	0.450	2.67×10^3
Blood	8.3×10^4	4.2×10^7	2.5×10^5	0.499	2.67×10^3
Lung	1.4×10^3	1.3×10^3	3.1×10^3	0.105	5.34×10^2
Aortic wall	2.8×10^5	2.8×10^6	8.0×10^5	0.453	2.67×10^3
Mediastinum	2.6×10^4	3.1×10^5	7.6×10^4	0.459	2.67×10^3

In static analysis the standard Gauss elimination technique is used to solve the force-deformation relationship with a triangular decomposition of stiffness matrix K. In transient analysis direction integration scheme with implicit solution is followed by using a one-step Newmark method to discretize in time and a Newton method to solve the problem.

With FEAP extensions of the present study into cases with nonlinear elastic or linear viscoelastic materials are possible.

RESULTS

For static analysis, three loading cases were performed on model A. Pressure loading of 50 psi is applied on the frontal chest wall, side wall, or posterior wall in case S-3, S-4, or S-5, respectively.

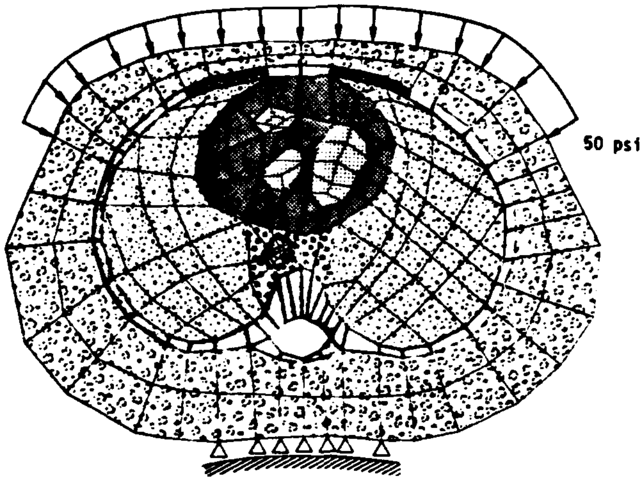
On model B (see Figure 37b), instead of a closed ring type rib cage a segmental type rib is used to account for the average roles and properties of a three-dimensional rib cage structure. Five psi of pressure loading is applied on the frontal chest wall (case S-6) and side wall (case S-7). Load configurations are shown in Figure 37c. Undeformed as well as deformed cross sectional geometric configurations for cases S-3, -4, -5, -6, and -7 are shown in Figures 38, 39, 40, 41, and 42, respectively.

For case S-3 the magnitudes of the average stress components at different element in each of the organs are shaded in different darkness (Figure 43). Follow the order of lung, skeletal muscle, ribs, costal cartilage, heart, aortic vessel wall, mediastinum, and blood, stress components σ_x, σ_y, and σ_{xy} are labeled on different graphs.

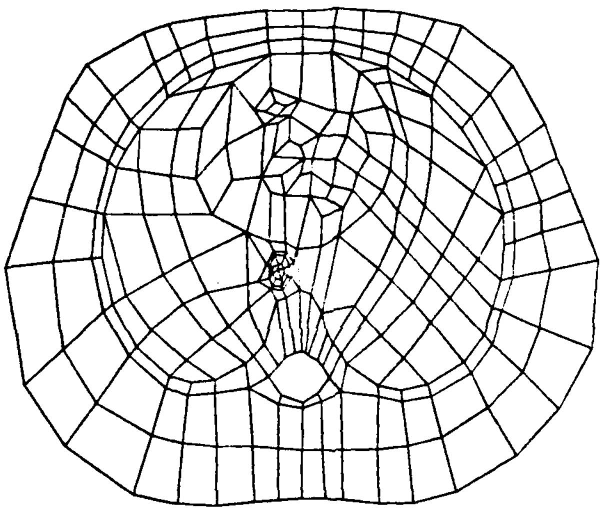
DISCUSSION

Results from static analysis give the developed stress due to deformation as the pressure loading is applied on the external surface. Regional differences in different organs in various loading cases can be seen.

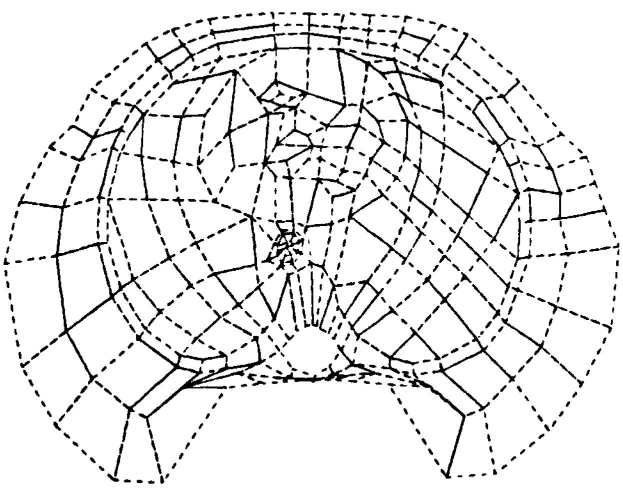
The magnitude of the stress in the lung predicted based on model A is only of the order 0.1 psi when the externally applied pressure is 50 psi, since the high stiffness closed ring type ribs in model A essentially constitute a strong shield or protection wall to the lungs and soft tissues, or



(a) Model A with Loading Indicated

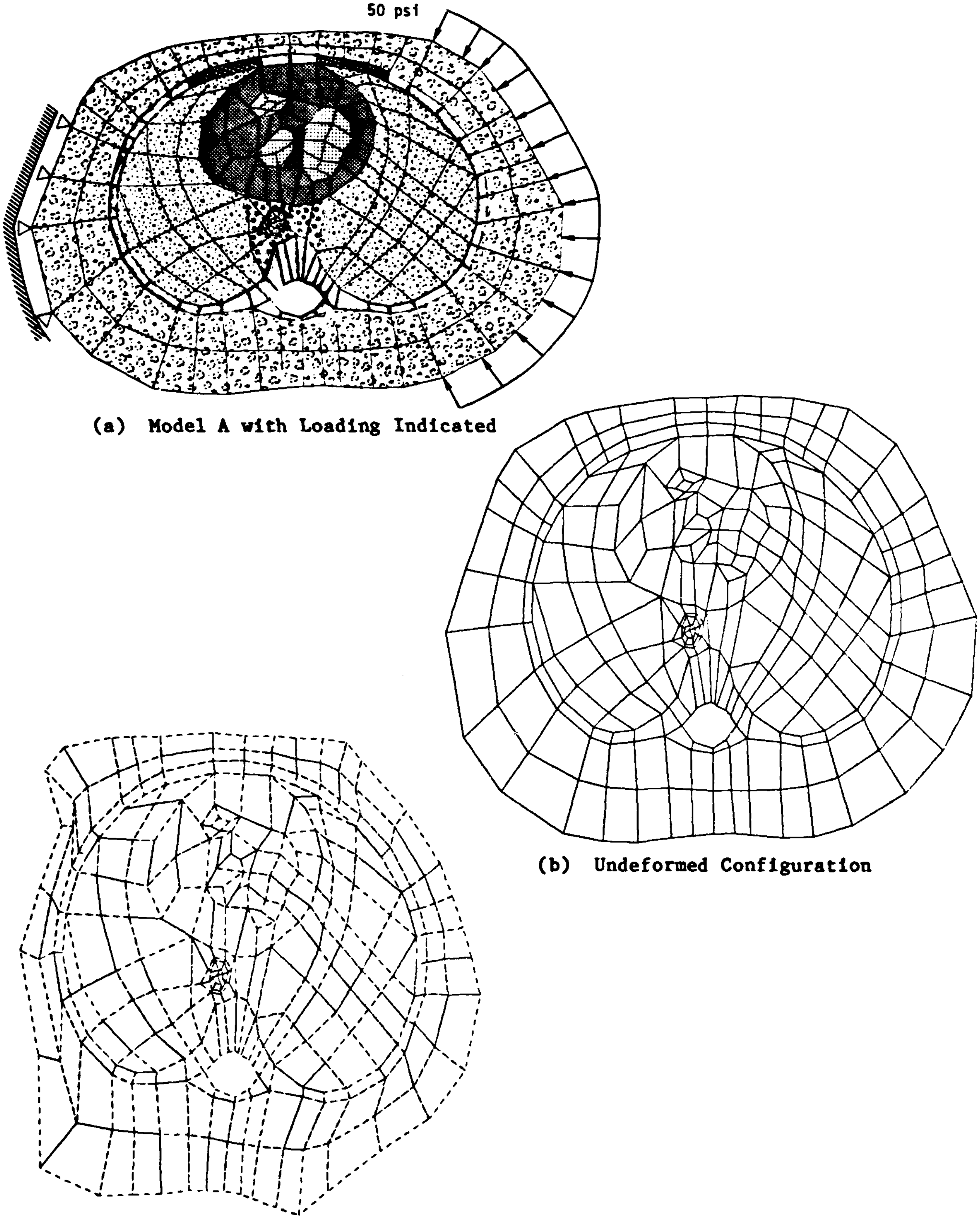


(b) Undeformed Configuration



(c) Deformed Configuration

Figure 38. Case S-3 in Various Configurations.

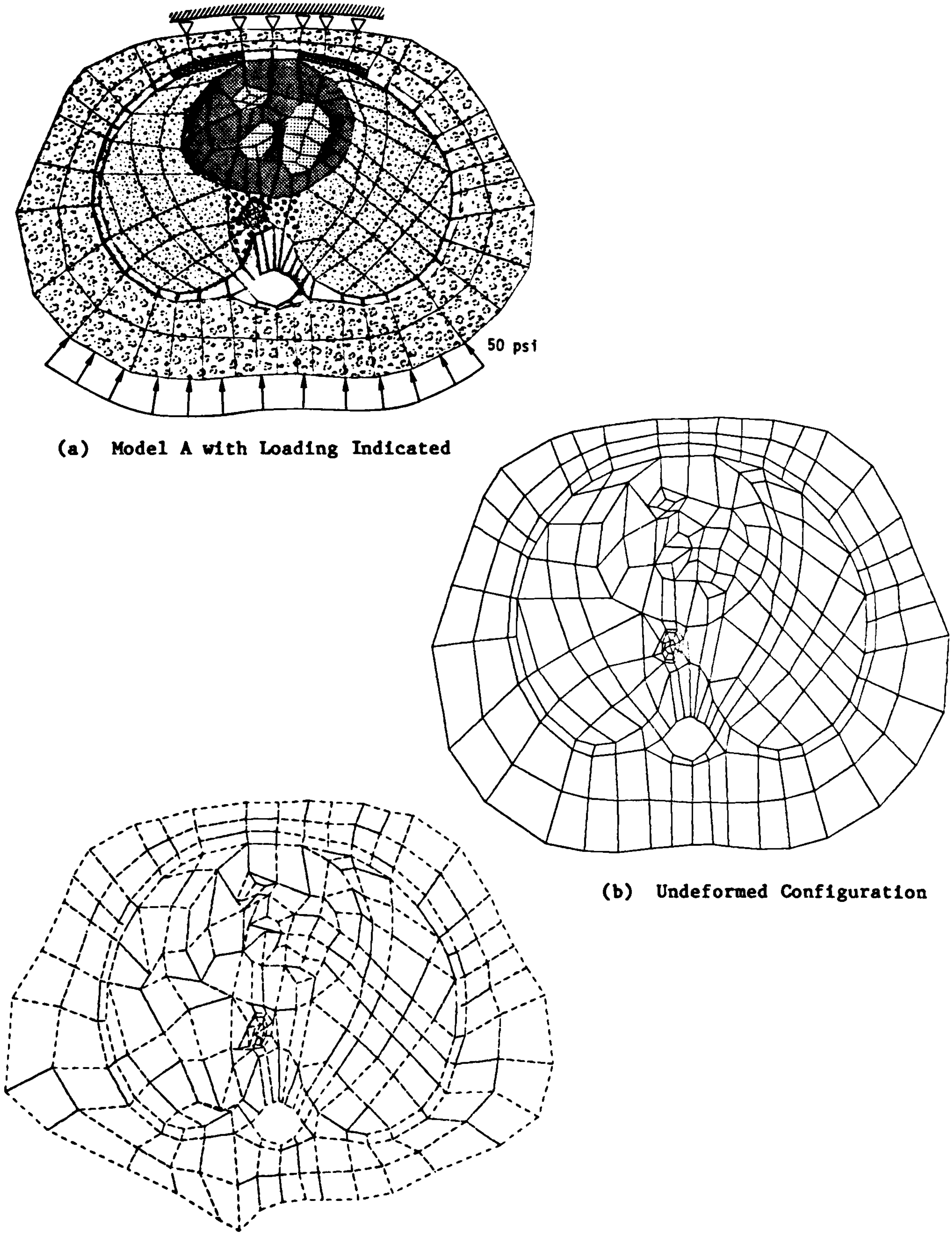


(a) Model A with Loading Indicated

(b) Undeformed Configuration

(c) Deformed Configuration

Figure 39. Case S-4 in Various Configurations.

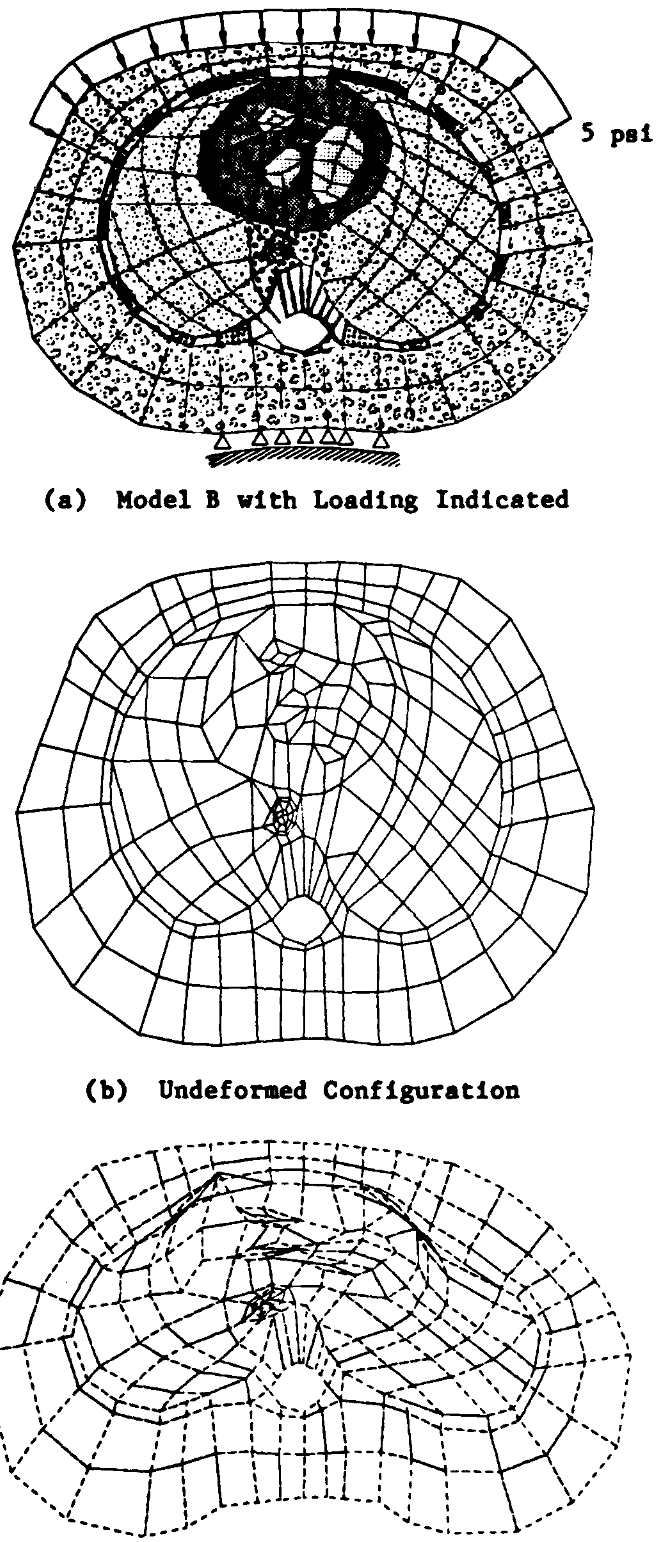


(a) Model A with Loading Indicated

(b) Undeformed Configuration

(c) Deformed Configuration

Figure 40. Case S-5 in Various Configurations.

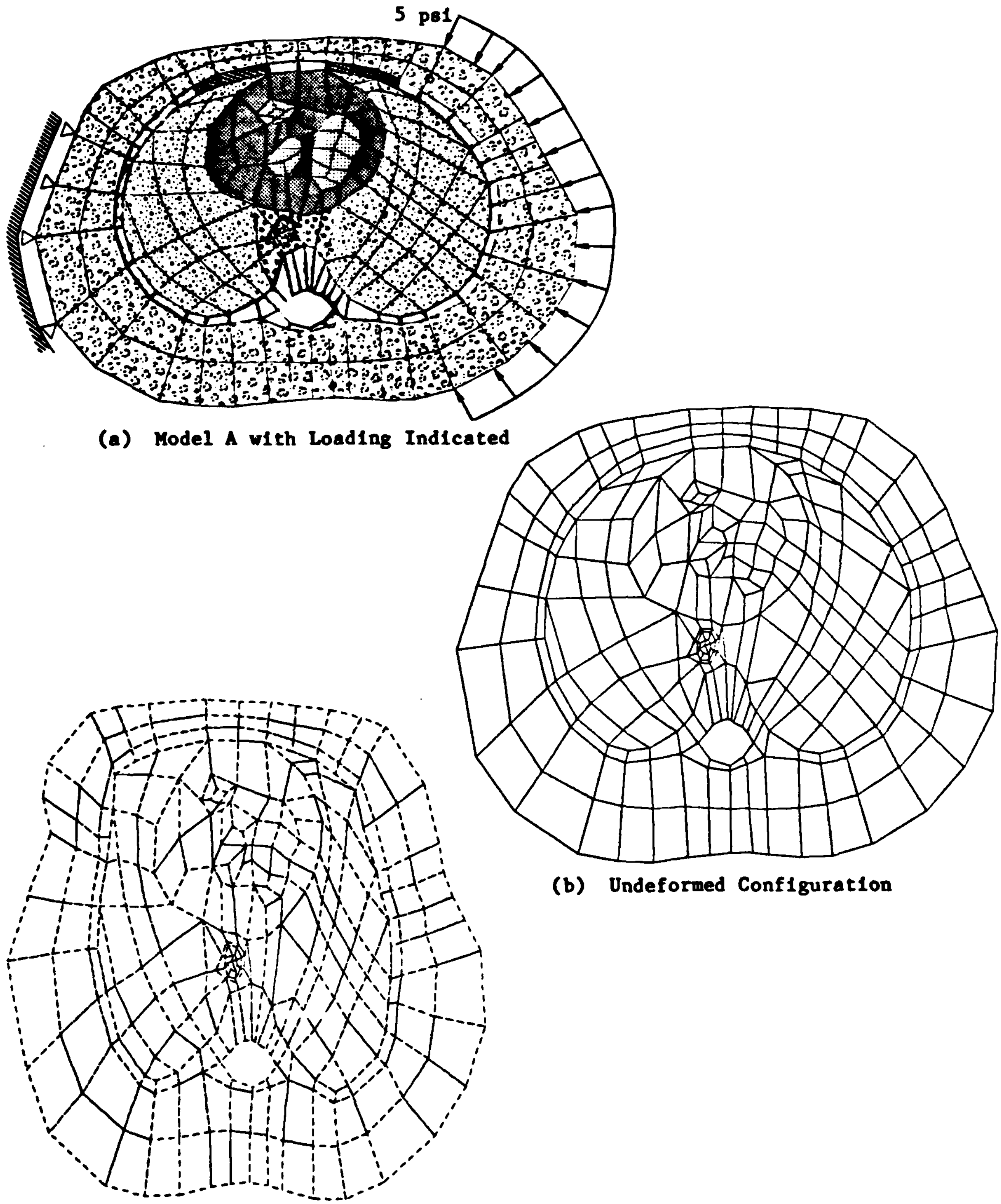


(a) Model B with Loading Indicated

(b) Undeformed Configuration

(c) Deformed Configuration

Figure 41. Case S-6 in Various Configurations.



(a) Model A with Loading Indicated

(b) Undeformed Configuration

(c) Deformed Configuration

Figure 42. Case S-7 in Various Configurations.

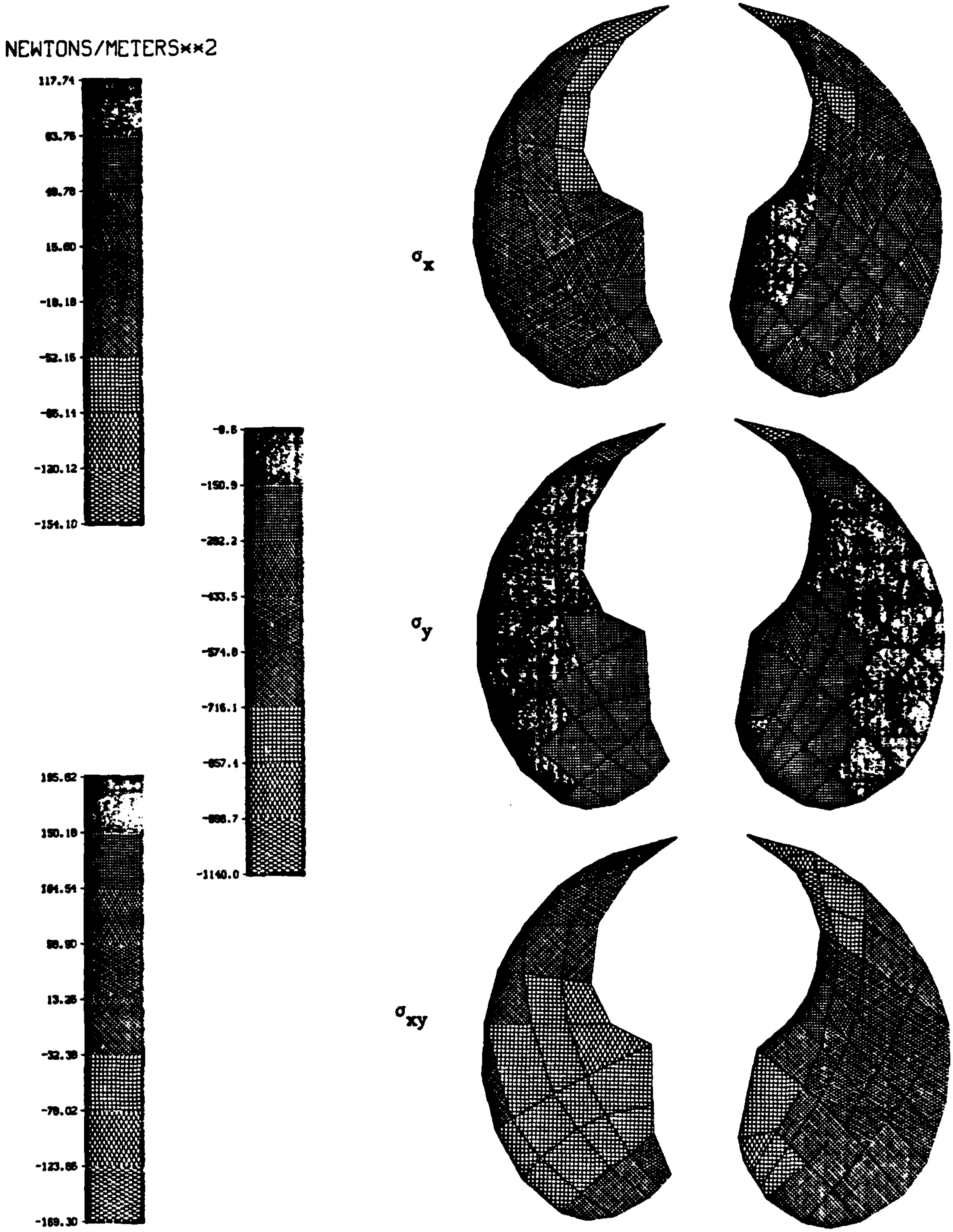


Figure 43. Stress Distribution on Different Organs (all Case S-3)

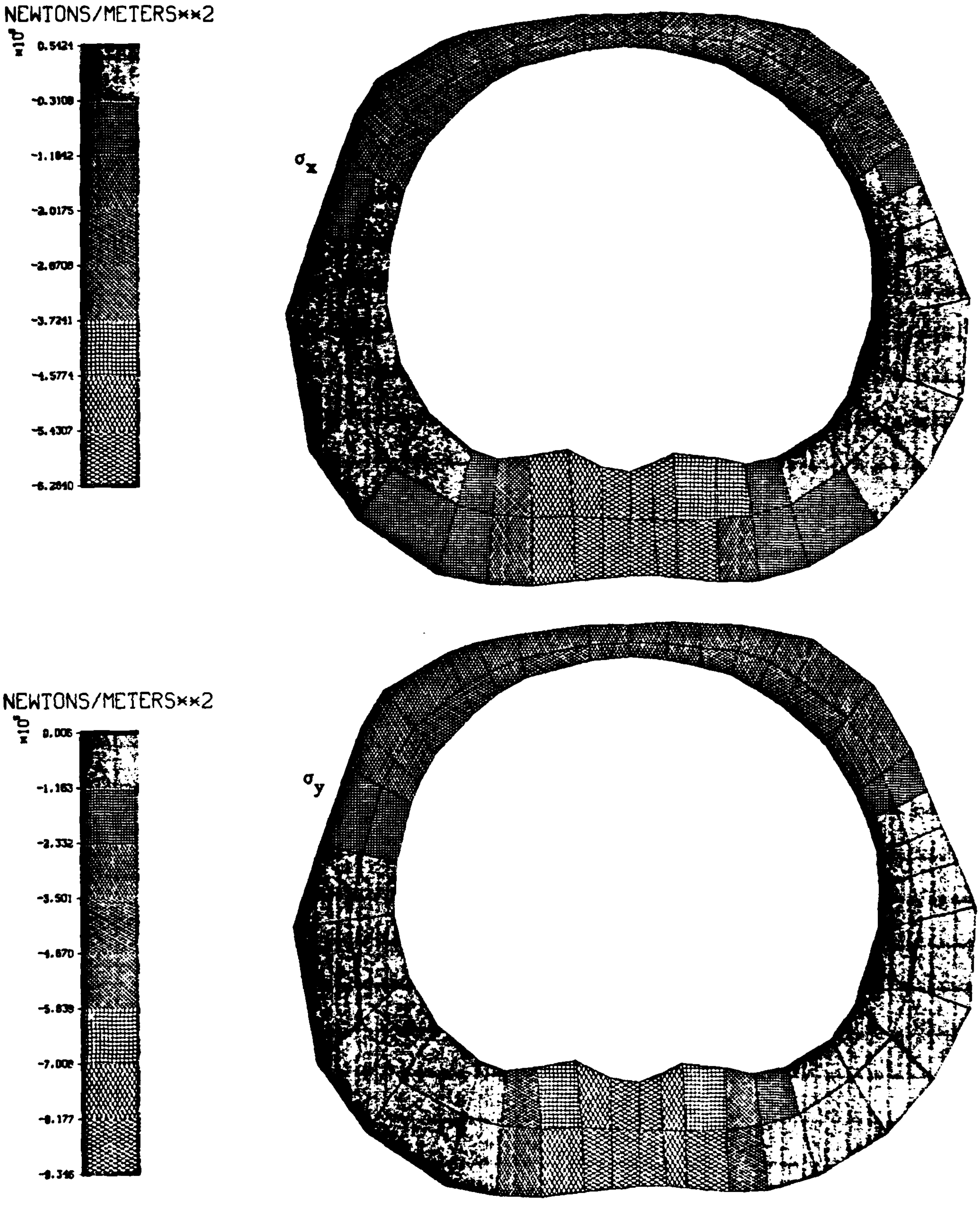


Figure 43. (Cont'd)

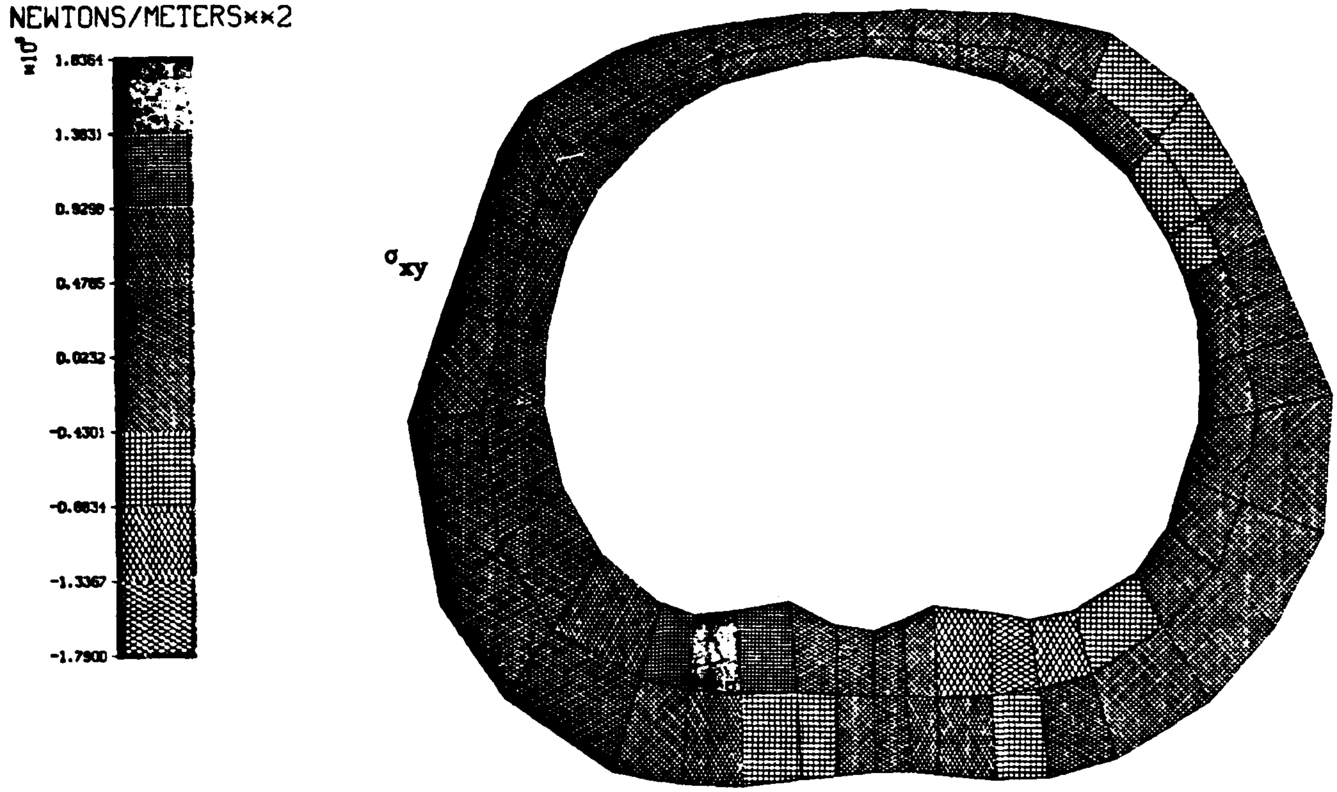


Figure 43. (Cont'd)

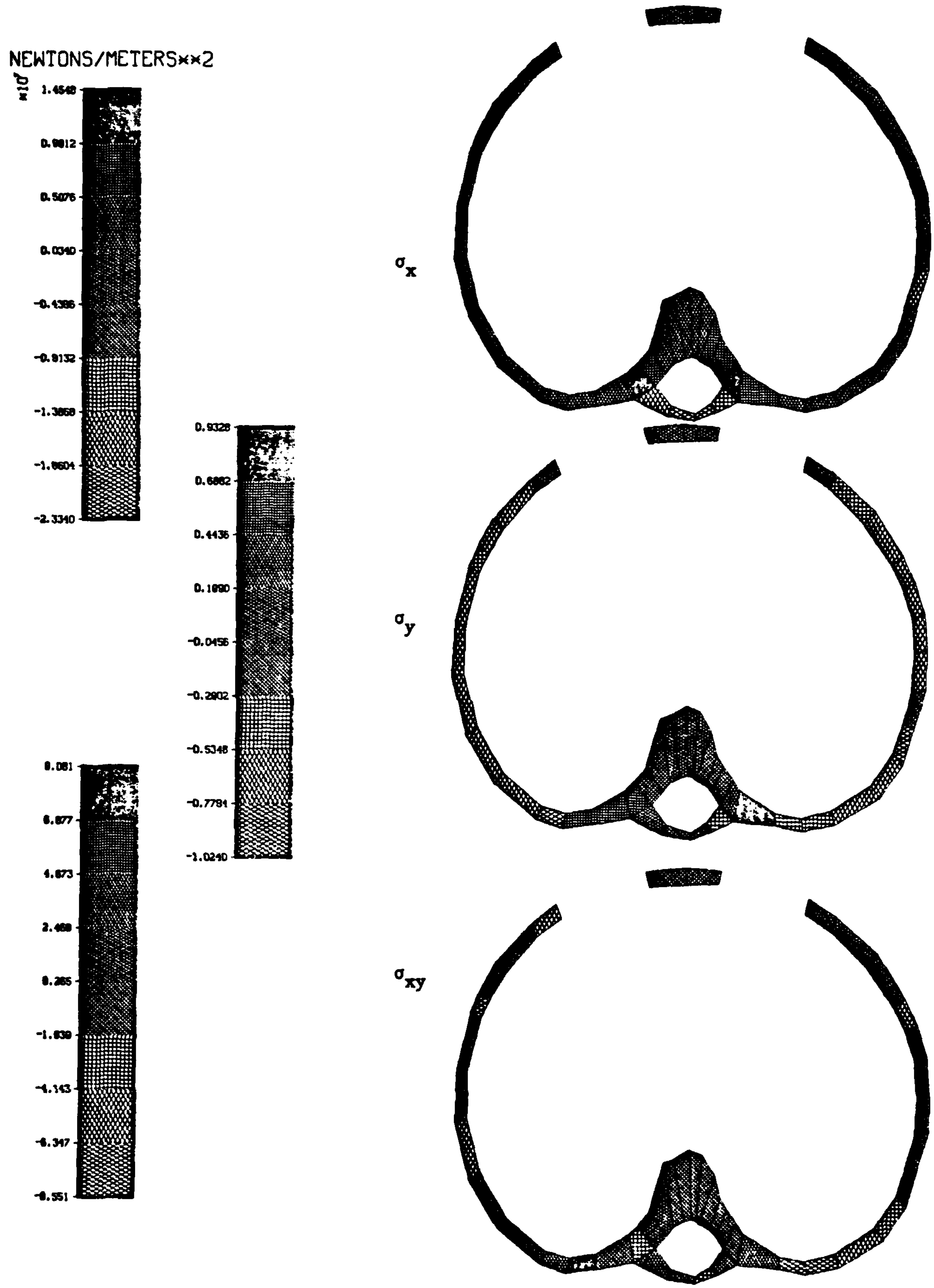


Figure 43. (Cont'd)

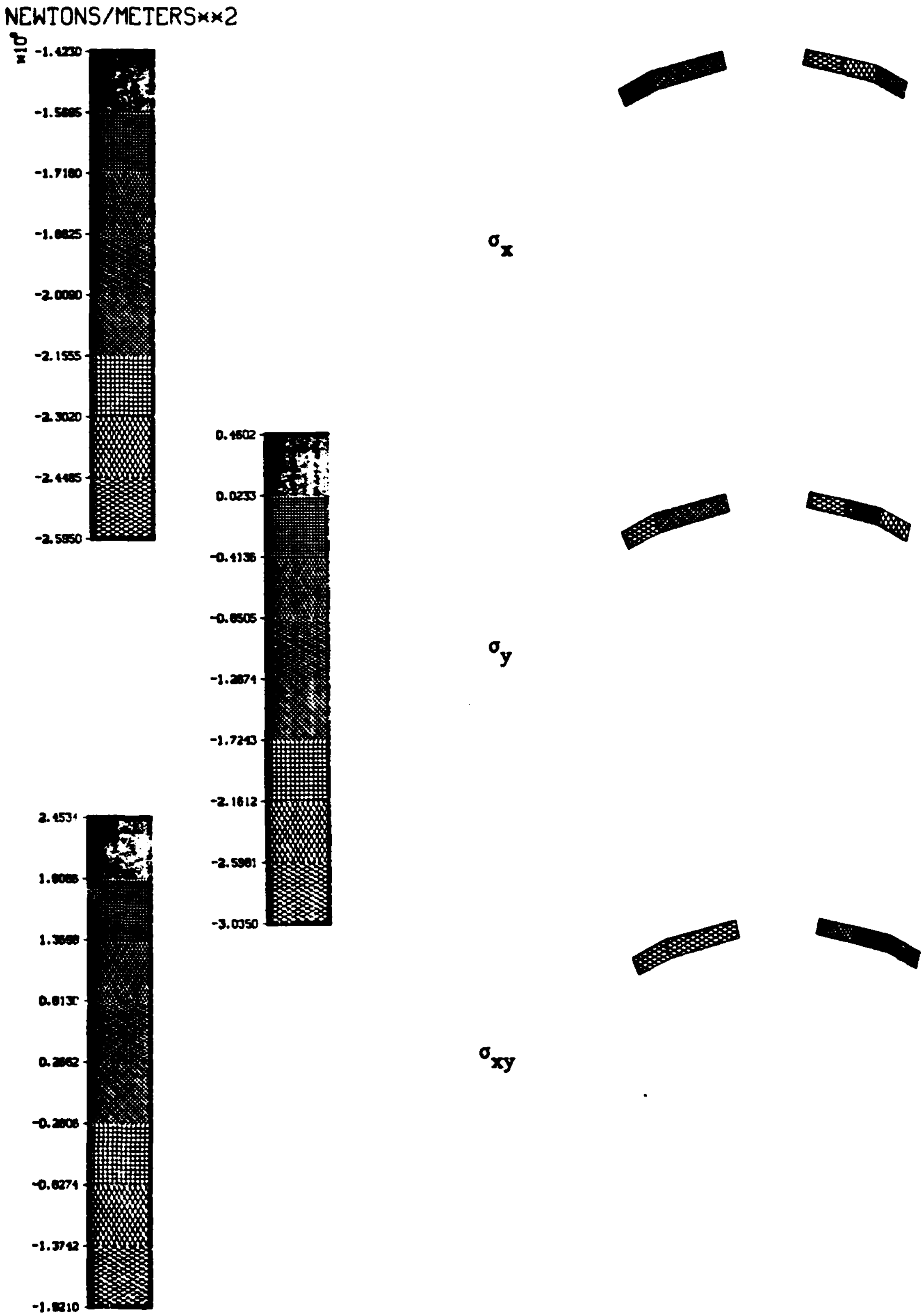


Figure 43. (Cont'd)

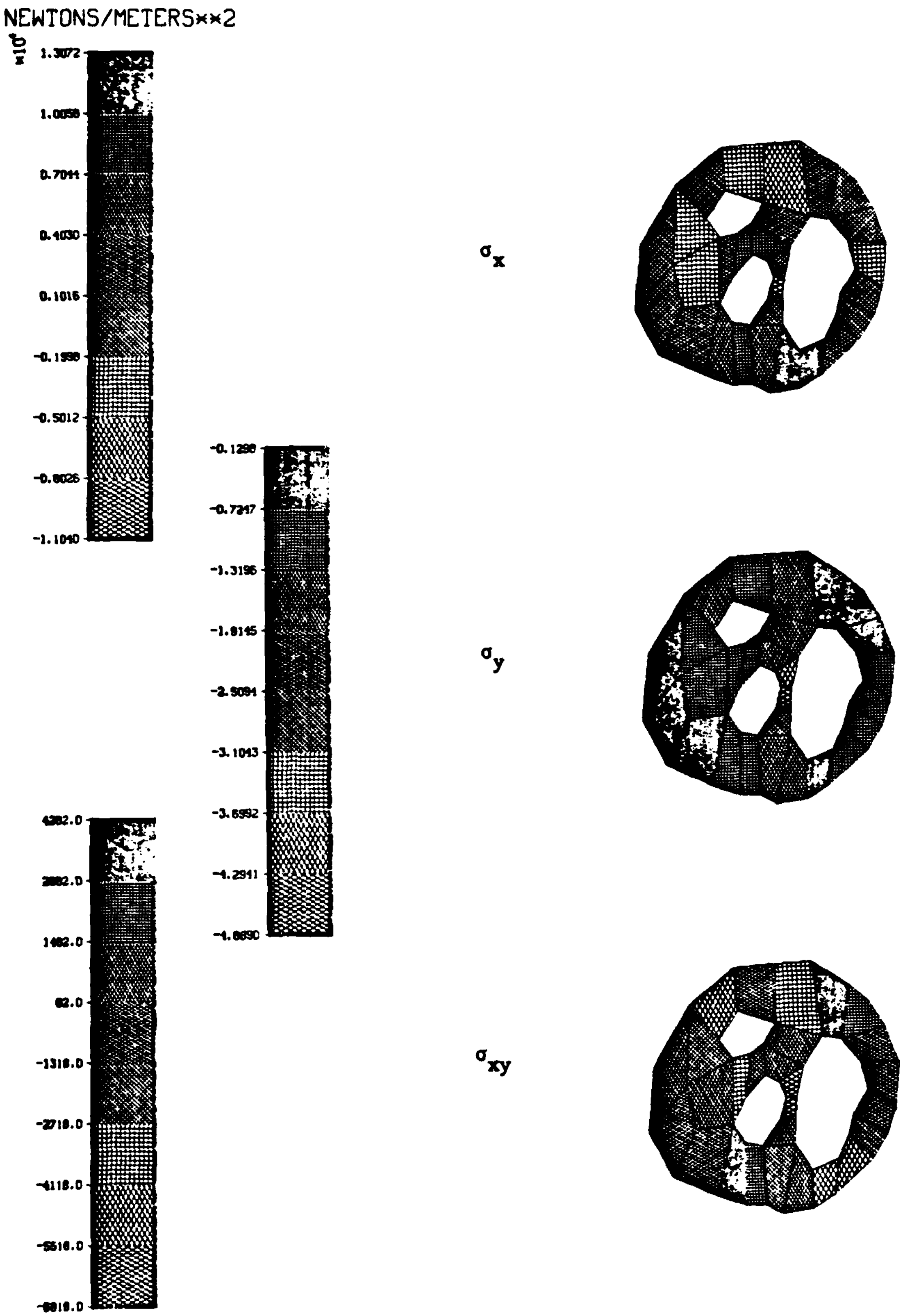


Figure 43. (Cont'd)

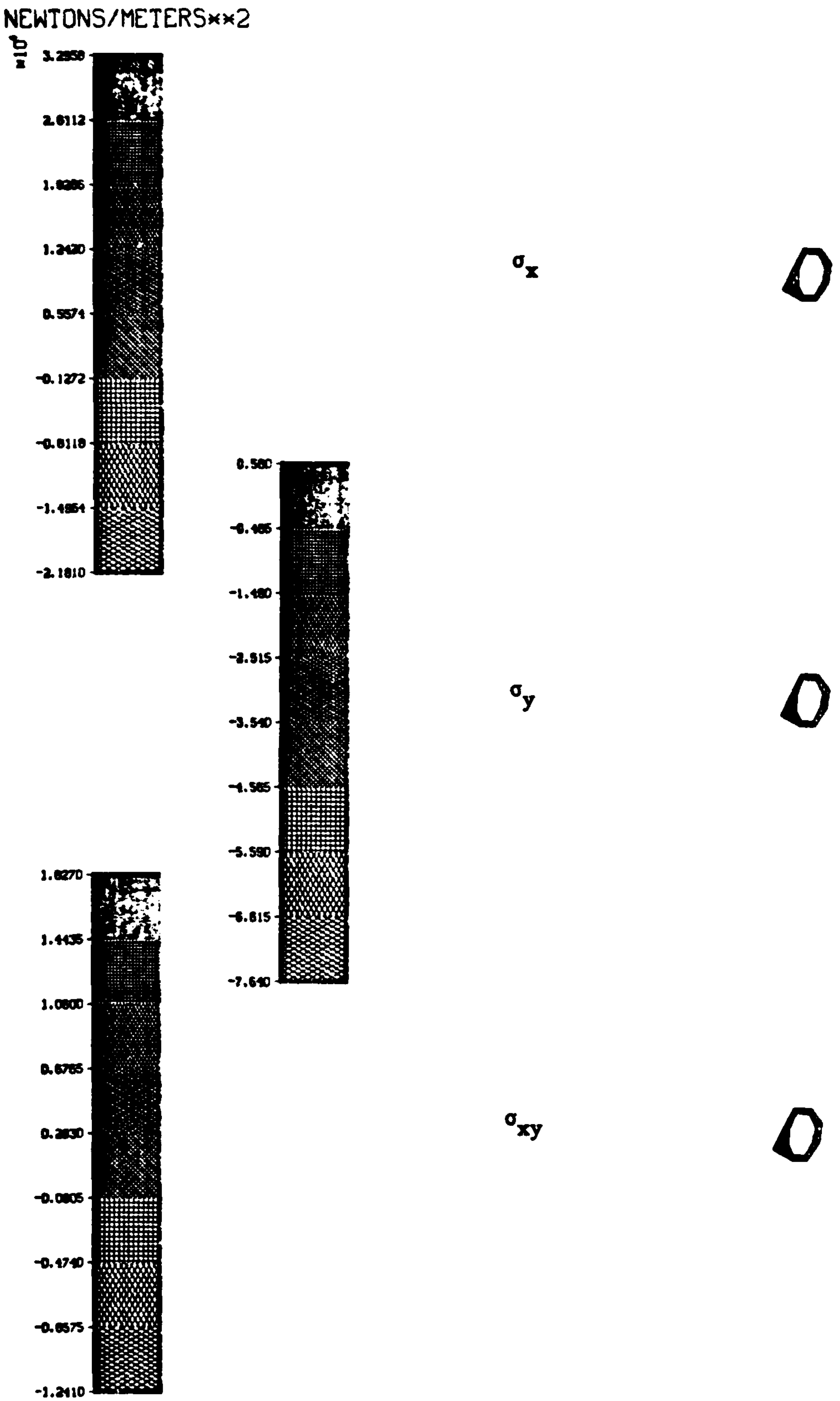


Figure 43. (Cont'd)

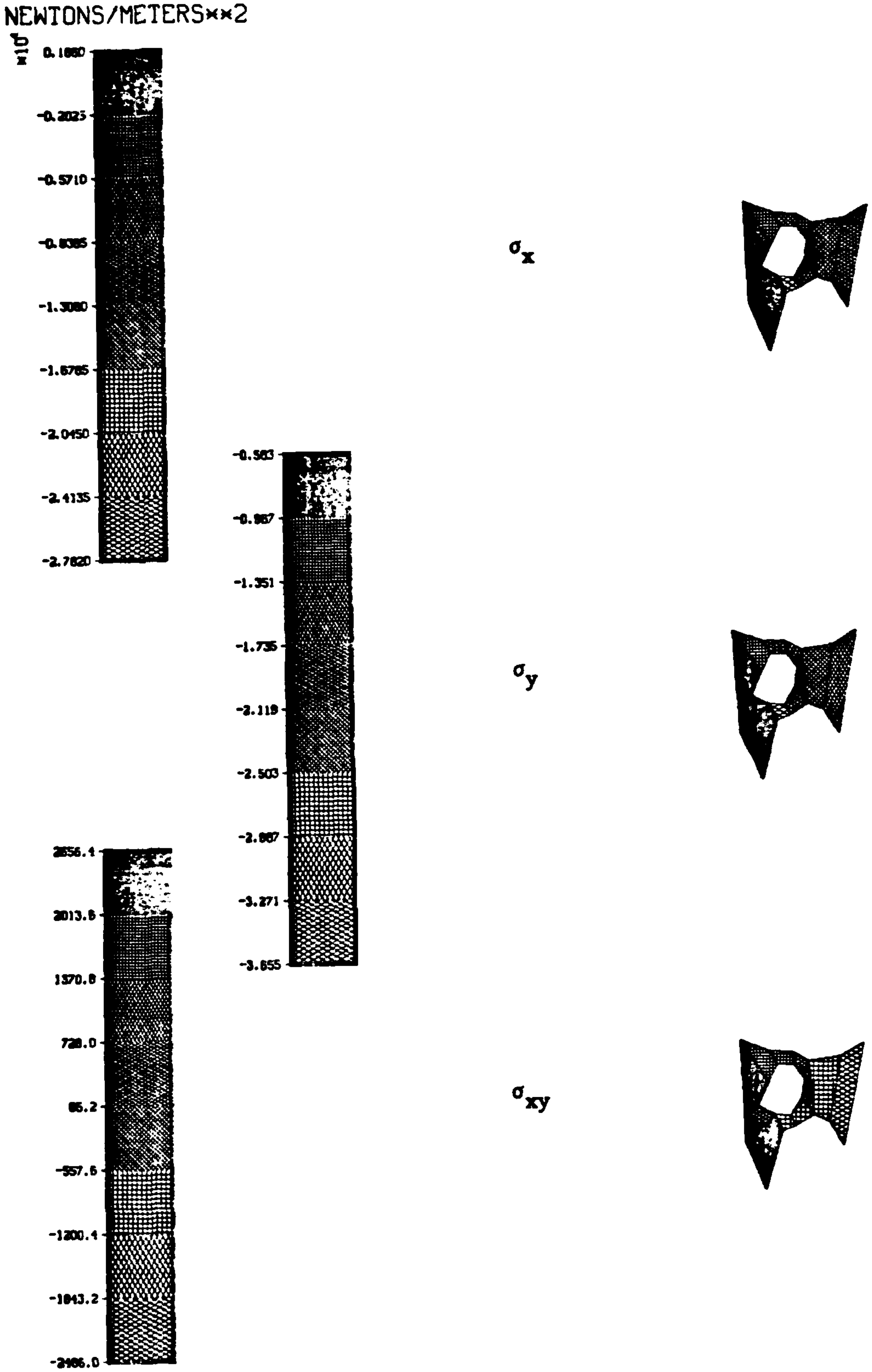


Figure 43. (Cont'd)

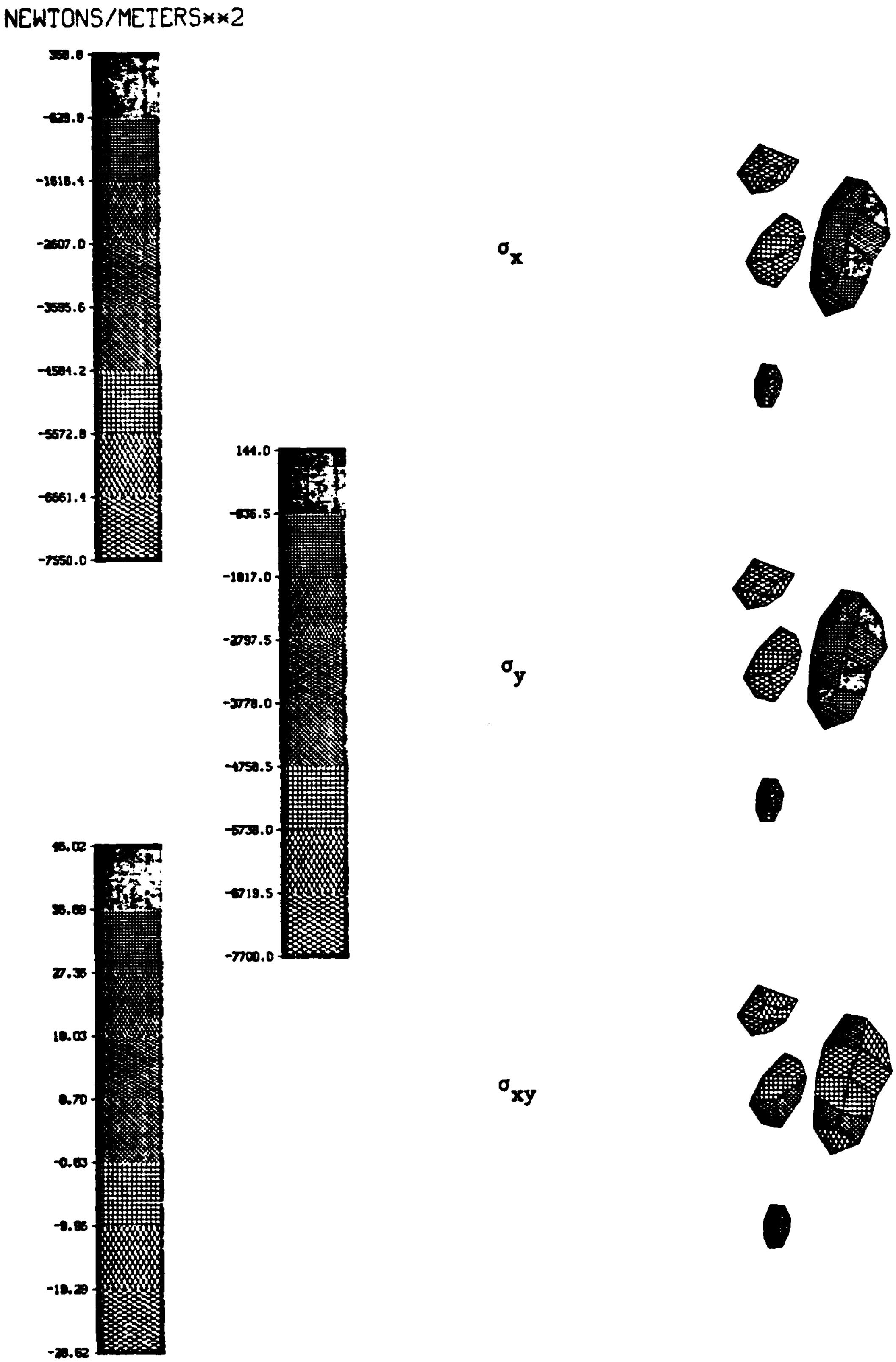


Figure 43. (Cont'd)

organs inside it. To account for the roles of a three-dimensional rib cage during pressure loading we, therefore, use a segmental type rib model B in this two-dimensional model. The idea is so that average properties and roles of the bony and muscle parts can be estimated. With model B the stress in the lung is of the order of 0.5 psi when the external pressure loading is 5 psi. Based on this comparison it is reasonable to assert that model B is a better candidate. However, further development and modifications of the two-dimensional model is still under way. We have observed the stiffness difference of the whole thorax structure is tremendous as we change from model A to model B. The relative orientation of ribs and the lung tissue behind them, the contributing factor of the rib cage to the lung injury mechanism, protective or negative? These are all interesting topics to be studied.

We have shown one way to estimate the stress distributions in the lung due to gross deformation resulting from pressure loading on the external body surface. The order of magnitude, however, is considerably small. Experimental results reported by Bowen et al. (1968) indicate the intrathoracic overpressure of a 10 kg dog could go as high as hundreds of psi during exposure to air blast shock wave. This type of overpressure or high stress is probably caused primarily by the propagation of incident waves and their scatterings and diffractions. Wave study is currently under way.

We have considered the lung as an organ made of very compliant spongy material. In actuality the lung is a collection of millions of tiny alveoli (air-containing sacs) at a more refined scale. As an air-containing structure during rapid compression the pressure volume relationship of the air contained in the lung should change drastically. The incorporation of a pressure-volume relationship for the air inside the lung into the FEM model is currently being done.

The current model has assumed no relative motion among interfaces of the organs. This assumption will influence the loading-response prediction and the thorax model in being extended to include slip.

We have also performed transient analyses. Sample problem of uniform stretching a metal sheet with a center hole has been carried out as a test of dynamic analysis capability of the FEAP code. Transient analysis of our thorax

model B response to 5 msec of pressure step loading (5 psi) has also been carried out. The task of detailed transient response analysis is in progress.

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Yamada, H., Strength of Biological Materials, The Williams and Wilkins Co., Baltimore, 1970.

Radford, E. P., "Recent Studies of Mechanical Properties of Mammalian Lungs," in Tissue Elasticity, ed. J. W. Remington, American Physiological Society, Washington, D.C., pp. 177-190, 1957.

Bergel, D. H., in Biomechanics: Its Foundations and Objectives, eds. Y. C. Fung, N. Perrone, and M. Anliker, Prentice-Hall, Englewood Cliffs, N.J., p. 105-140, 1972.

Taylor, R. L. and J. L. Sackman, "Contact-Impact Problem," Report No. SESM 78-4, University of California at Berkeley, 1978.

Bowen, I. G., E. R. Fletcher, D. R. Richmond, F. G. Hirsch and C. S. White, "Biophysical Mechanisms and Scaling Procedures Applicable in Assessing Responses of the Thorax Energized by Air-Blast Overpressures or by Nonpenetrating Missiles," Annals of the New York Academy of Sciences, V. 152, pp. 122-146, 1968.

5.2 FINITE DIFFERENCE REPRESENTATION OF PRESSURE WAVES IN THE PARENCHYMA

In order to evaluate the effects of pressure waves in the spongy lung parenchyma, the JAYCOR SPUNG Code was used to calculate the refraction and reflection of pressure waves in an idealized lung cross section. The code solves the material properties describing compressive wave propagation in materials of varying properties, and was set up to describe lung shapes regions of high compressibility, surrounded by material of low compressibility representing the solid and liquid-filled organs of the thorax cross section. The model was then excited by pressure waves of varying strengths passing around the perimeter and observing the body response.

The accompanying figures show examples of the complex pressure distributions that develop within the lungs and the pressure time histories at particular points within the lung. The results show a complex overpressure field which locally can become many times greater than the incident waves, and can lead to local damage, especially upon reflection from dissimilar materials. Such behavior is possibly the source of localized damage that is thought to

occur in low blast level injury. This representation when coupled with the body dynamics and the body loading gas dynamics supplies a complete description of the mechanical coupling.

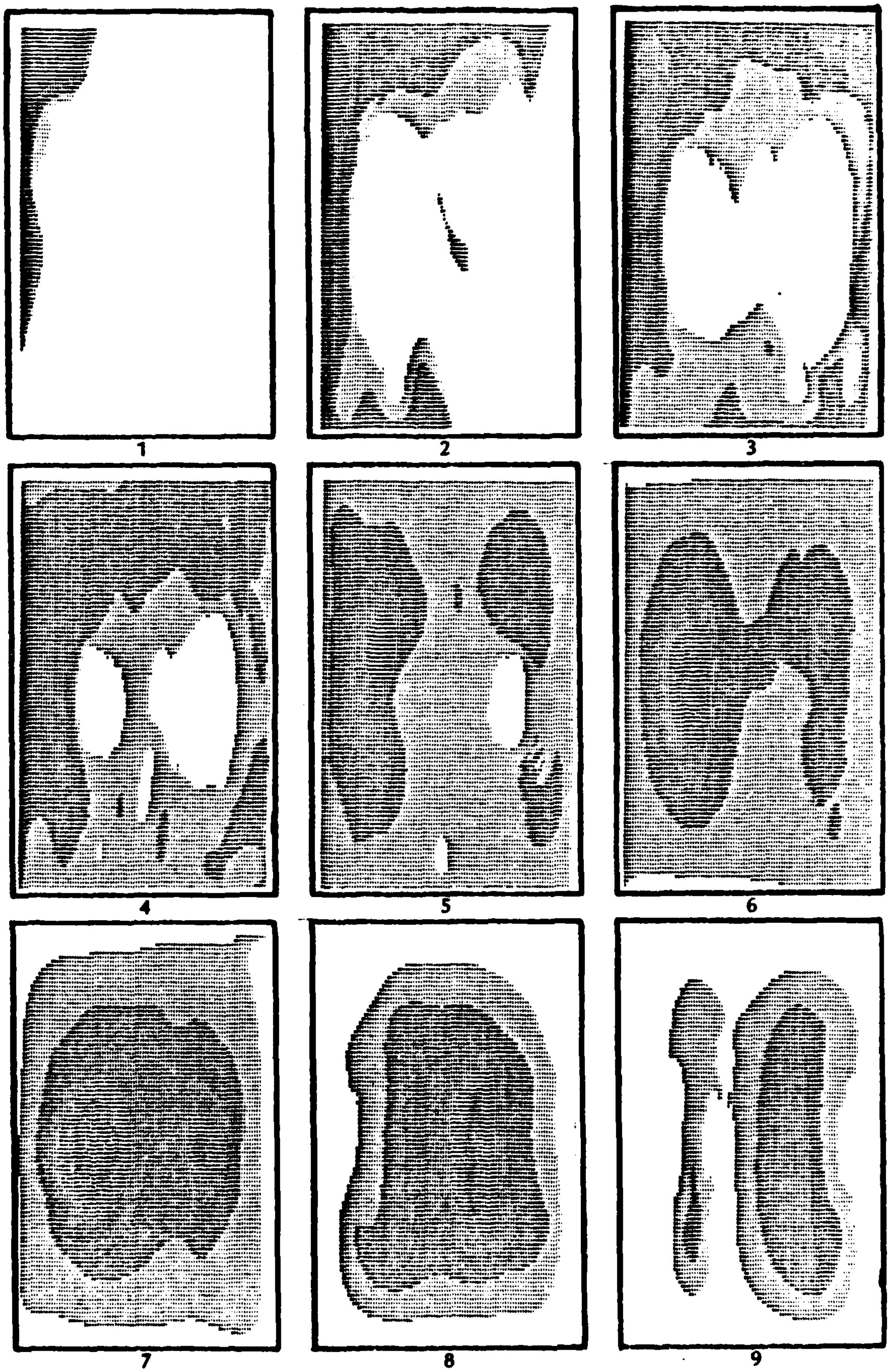


Figure 44. Calculation of pressure wave propagation through a two-dimensional cross-section of a heterogeneous body with stiff, high density sections, representing muscle and bone; and spongy, low density sections representing the lungs. The sequence of pictures shows a wave incident from the top left that leads to an overpressure focussing in the right lung that has three times the pressure of the incident wave.

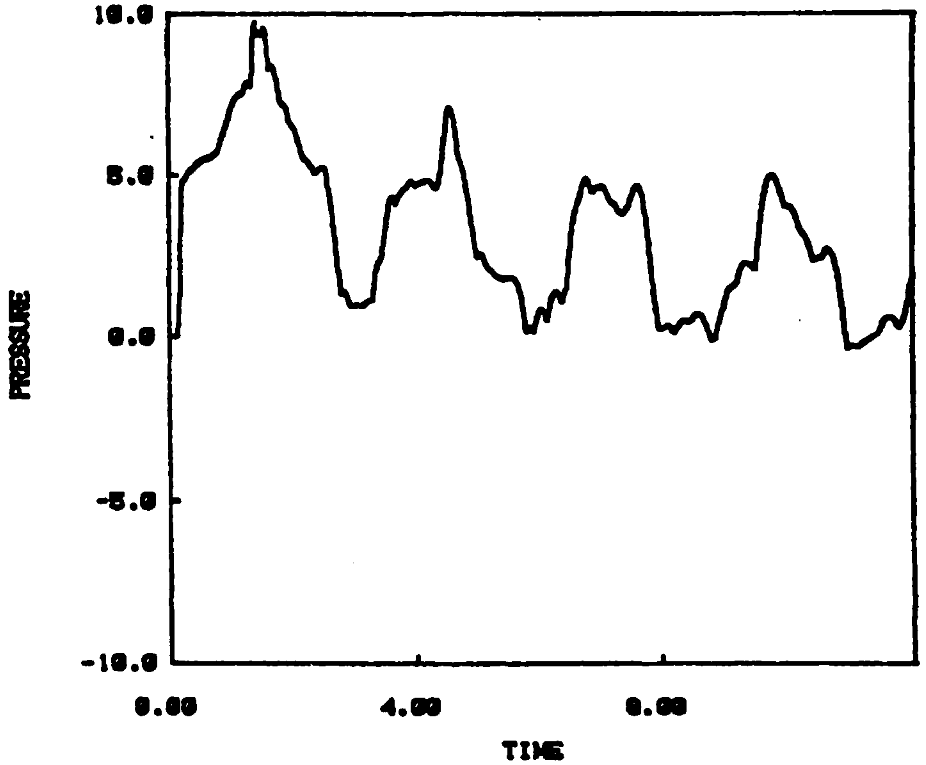


Figure 45. Time History of Maximum Overpressure in the Lung Modeled by the SPUNG Code. The initial blast wave has a maximum pressure of 3 psi yet local overpressures of almost 10 psi can be formed by wave focussing. This enhancement of pressure and the period of oscillation arise out of the assumed material properties, which in this case are somewhat arbitrary but could be determined more precisely by controlled laboratory measurements. There is, however, qualitative agreement with the measured traces reported by Lovelace.

6. SUMMARY AND CONCLUSIONS

In summary, the tasks performed under this contract and its modifications have scoped and developed the technologies required to assist the blast overpressure program in quantifying and validating the damage risk criteria for future weapon deployment. As was mentioned earlier, this effort has been directed toward guiding the use of technology as well as implementing it into a specific form. The availability of complete and consistent models connecting the blast source through the far field propagation to the loading on the body to the structural response, and finally to the local stress distributions within the lung is an important part of the blast overpressure program mission.

APPENDIX A

CITATIONS FROM LITERATURE SEARCH I

LITERATURE SEARCH - I

LUNG INJURY DUE TO BLAST EFFECT

DATA BASE		NUMBER OF CITATIONS
NTIS		62
BIOSIS		137
NASA		29
	TOTAL	228

● Denotes articles being looked at.

Assessment of the Radiological Impact of the Inactive Uranium-Mill Tailings at Shiprock, New Mexico

Oak Ridge National Lab., TN.*Department of Energy. (4832000)
AUTHOR: Haywood, F. F.; Goldsmith, W. A.; Lantz, P. M.; Fox, W. F.; Shinpaugh, W. H.
G1313L2 Fld: 18G, 68F, 77G GRAI8015
Dec 79 94p
Contract: W-7405-ENG-26

Abstract: Uranium-mill tailings at an inactive site near Shiprock, New Mexico, contain an estimated 950 curies (Ci) of exp 226 Ra together with its radioactive daughters. A radiological survey was conducted at this site in February 1976. Decontamination work and tailings stabilization performed at the site since that time have greatly changed conditions there and little effort was applied to quantification of potential health effects in comparison to the earlier consideration of the site at Salt Lake City. The present report delineates the radiological conditions that existed at the time of the survey including information on the surface and below-surface distribution of exp 226 Ra. The data presented support the conclusion that diffusion of radon and inhalation of radon daughters is the principal mode of exposure of offsite population groups. (ERA citation 05:011369)

Descriptors: *Feed materials plants, *Mill tailings, *Radium 226, *Radon, *Uranium, New mexico, Background radiation, Carcinomas, Decontamination, Diffusion, Environmental effects, Environmental exposure pathway, Environmental transport, Health hazards, Inhalation, Lungs, Mathematical models, Radiation monitoring, Radioactive waste disposal

Identifiers: ERDA/053000, ERDA/500300, ERDA/510301, ERDA/052002, NTISDE

ORNL-5447 NTIS Prices: PC A05/MF A01

Estimates of Pulmonary and Gastrointestinal Deposition for Occupational Fiber Exposures

North Carolina Univ. at Chapel Hill. Occupational Health Studies Group.*National Inst. for Occupational Safety and Health, Cincinnati, OH. Div. of Surveillance, Hazard Evaluation and Field Studies. (045592054)

Technical rept.
AUTHOR: Dement, John M.; Harris, Robert L. Jr
G0924I4 Fld: 6J, 6F, 57U, 68G, 68A GRAI8012
Apr 79 84p
Contract: PHS-78-2438
Monitor: DHEW/PUB/NIOSH-79-135

Abstract: The fraction of seven types of airborne fibers in 19 industrial settings predicted to be deposited in the deep pulmonary spaces and that fraction that might be ingested were estimated. Deposition estimates also were generated for fibers considered significant for tumor production. An unvalidated mathematical model for predicting the deposition of uniform straight rods of high aspect ratio was used. The pulmonary deposited fraction was considered to be those fibers deposited beyond the ciliated portion of the respiratory system. The ingested or gastrointestinal fraction was assumed to be those fibers cleared by the nasopharynx and tracheobronchial clearance processes and swallowed and was approximated based on the clearance to the gastrointestinal tract of all fibers deposited in the tracheobronchial compartment and 75 percent of those deposited in the nasopharynx beyond the nasal hairs. Partially quantitative results show that the numerical fractions estimated to be deposited in the pulmonary spaces ranged from approximately 3 to 16 percent, while the gastrointestinal fractions ranged from 11 to 59 percent. Large differences in deposition patterns for fibers in the size range considered most important for tumor production in laboratory animals by Stanton et al (1977) also were noted.

Descriptors: *Fibers, *Industrial medicine, Air pollution, Respiratory system, Estimates, Mathematical models, Ingestion(Biology), Gastrointestinal system, Asbestos, Lung, Glass fibers

Identifiers: *Occupational safety and health, Carcinogens, NTISHEWOSH

PB80-149644 NTIS Prices: PC A05/MF A01

Internal Dosimetry Data and Methods of ICRP. Part 1

Oak Ridge National Lab., TN.*Department of Energy. (4832000)
AUTHOR: Ford, M. R.; Bernard, S. R.; Dillman, L. T.; Watson, S. R.
F2065G1 Fld: 6R, 57V, 68F GRAI7923
15 Sep 78 68p
Rept No: ORNL/NUREG/TM-315
Contract: W-7405-ENG-26
Monitor: 18

Abstract: The methodology being used to update the International Commission on Radiological Protection (ICRP) report of Committee 2, ICRP Publication 2 on Permissible Dose for Internal Radiation, is described. The system of differential equations, which is used to calculate the cumulated activity in the lungs, gastrointestinal tract, other body organs, and the transfer compartment of reference man, is presented. These equations describe the physical decay and metabolism of a radionuclide as governed by the lung and gastrointestinal tract models adopted by Committee 2 from models developed for the ICRP. The equations also take into account organ uptake and retention following intake into blood and the contribution of activity from radioactive daughter nuclides. Additionally, the scheme for estimating the dose from immersion in a radioactive cloud and the scheme for computing the nuclear decay data needed for all of the dose computations are presented. In computing the immersion dose, estimates for both the infinite and the finite cloud are considered. (ERA citation 04:045451)

Descriptors: *Dosimetry, *Gastrointestinal tract, *ICRP, *Lungs, *Organs, *Radioactive clouds, *Radioisotopes, Compartments, Computer calculations, Decay, Differential equations, Dose commitments, Dose equivalents, Ingestion, Inhalation, Internal irradiation, Man, Mathematical models, Metabolism, Radiation protection, Radionuclide kinetics, Recommendations, Reference man, Retention, Tissue distribution

Identifiers: ERDA/560171, ERDA/560161, ERDA/655003, NTISDE

NUREG/CR-0789 NTIS Prices: PC A04/MF A01

Internal Dosimetry Data and Methods of ICRP. Part I

Oak Ridge National Lab., TN.*Nuclear Regulatory Commission, Washington, DC. Office of Standards Development.*Department of Energy, Washington, DC. (263 050)
AUTHOR: Ford, M. R.; Bernard, S. R.; Dillman, L. T.; Watson, S. R.
F1755L2 Fld: 6R, 18H, 57V, 77 GRAI7920
Jun 79 69p
Rept No: ORNL/NUREG/TM-315
Contract: W-7405-eng-26
Monitor: 18

Abstract: The methodology being used to update the International Commission on Radiological Protection (ICRP) report of Committee 2, ICRP Publication 2 on Permissible Dose for Internal Radiation, is described. The system of differential equations used to calculate the cumulated activity in the lungs, gastrointestinal tract, and other body organs is presented. These equations take into account organ uptake and retention following intake into blood and the contribution of activity from radioactive daughter nuclides. Additionally, the scheme for estimating the dose from immersion in a radioactive cloud and the scheme for computing the nuclear decay data needed for all of the dose computations are presented. In computing the immersion dose, estimates for both the infinite and the finite cloud are considered.

Descriptors: *Radiation dosage, Radiation hazards, Humans, Lung, Gastrointestinal system, Mathematical models

Identifiers: NTISNUREG, NTISDE

NUREG/CR-0789 NTIS Prices: PC A04/MF A01

Internal Radiation Dose Calculations with the INREM II Computer Code

Oak Ridge National Lab., TN.*Department of Energy. (4832000)
AUTHOR: Dunning, D. E. Jr; Killough, G. G.
F1643J4 Fld: 6R, 57V GRAI7919
1978 16p
Contract: W-7405-ENG-26
Monitor: 18
12. annual symposium of the German Health Physics Society--radioactivity and the environment, Frisian Islands, F.R. Germany, Oct 1978.

Abstract: A computer code, INREM II, was developed to calculate the internal radiation dose equivalent to organs of man which results from the intake of a radionuclide by inhalation or ingestion. Deposition and removal of radioactivity from the respiratory tract is represented by the Internal Commission on Radiological Protection Task Group Lung Model. A four-segment catenary model of the gastrointestinal tract is used to estimate movement of radioactive material that is ingested, or swallowed after being cleared from the respiratory tract. Retention of radioactivity in other organs is specified by linear combinations of decaying exponential functions. The formation and decay of radioactive daughters is treated explicitly, with each radionuclide in the decay chain having its own uptake and retention parameters, as supplied by the user. The dose equivalent to a target organ is computed as the sum of contributions from each source organ in which radioactivity is assumed to be situated. This calculation utilizes a matrix of dosimetric S-factors (rem/ mu Ci-day) supplied by the user for the particular choice of source and target organs. Output permits the evaluation of components of dose from cross-irradiations when penetrating radiations are present. INREM II has been utilized with current radioactive decay data and metabolic models to produce extensive tabulations of dose conversion factors for a reference adult for approximately 150 radionuclides of interest in environmental assessments of light-water-reactor fuel cycles. These dose conversion factors represent the 50-year dose commitment per microcurie intake of a given radionuclide for 22target organs including contributions from specified source organs and surplus activity in the rest of the body. These tabulations are particularly significant in their consistent use of contemporary models and data and in the detail of documentation. (ERA citation 04:031495)

Descriptors: *Adrenal glands, *Bladder, *Bone marrow, *Carbon 14, *Cobalt 57, *Cobalt 58, *Cobalt 60, *Computer codes, *Iron 55, *Iron 59, *Kidneys, *Large intestine, *Liver, *Lungs, *Lymph nodes, *Manganese 54, *Ovaries, *Pancreas, *Phosphorus 32, *Rubidium 86, *Skeleton, *Small intestine, *Sodium 22, *Spleen, *Stomach, *Strontium 89, *Strontium 90, *Strontium 91, *Testes, *Thymus, *Thyroid, *Tritium, *Uterus, *Yttrium 90, *Yttrium 91, *Zinc 65, Bwr type reactors, Dose commitments, Dose equivalents, Dosimetry, Experimental data, Fuel cycle, I codes, Ingestion, Inhalation, Internal irradiation, Man, Mathematical models, Pwr type reactors, Tables

Identifiers: ERDA/560171, ERDA/560161, *Radiation dosage, *Health physics, NTISDE

CONF-7810123-1 NTIS Prices: PC A02/MF A01

Comparative Biokinetics of Radiogallium and Radioindium in Mice

Franklin McLean Memorial Research Inst., Chicago, IL.*Department of Energy. (9500342)
AUTHOR: Tsui, B. M. W.; Lathrop, K. A.
F1643F1 Fld: 6R, 57V, 68F GRAI7919
1978 17p
Contract: EY-76-C-02-0069
Monitor: 18
25. meeting of the Society of Nuclear Medicine, Anaheim, CA, USA, 26 Jun 1978.

Abstract: The biokinetics of radiogallium and radioindium in normal mice are compared using the compartmental modelling analysis. The rate constants obtained provide useful information in understanding the physiological and biochemical kinetics of radionuclides in the intact object. A comparison of the compartmental models for gallium and indium reveals the similarities and differences between the biokinetics of the two radionuclides. Furthermore, the results provide valuable information and guidance for human studies and clinical use. (ERA citation 04:037560)

Descriptors: *Gallium 67, *Gallium 68, *Indium 111, *Indium 113, *Radionuclide kinetics, Mice, Blood, Comparative evaluations, Experimental data, Graphs, Heart, Intestines, Intravenous injection, Isomeric nuclei, Kidneys, Liver, Lungs, Mathematical models, Spleen, Stomach, Tissue distribution, Uterus

Identifiers: ERDA/560172, ERDA/550601, Laboratory animals, Experimental data, Comparison, NTISDE

CONF-7806101-2 NTIS Prices: PC A02/MF A01

Similarity Between Man and Laboratory Animals in Regional Pulmonary Deposition of Ozone

Health Effects Research Lab., Research Triangle Park, NC. Statistics and Data Management Office.**Duke Univ. Medical Center, Durham, NC. Dept. of Pharmacology.

Journal article
AUTHOR: Miller, Frederick J.; Menzel, Daniel B.; Coffin, David L.
F0584K3 Fld: 6T, 6F, 57Y, 68G, 68A GRAI7908
22 Jul 77 20p
Rept No: EPA/600/J-78/081
Monitor: 18
Pub. in Environmental Research 17, p84-101 1978. Prepared in cooperation with Duke Univ. Medical Center, Durham, NC. Dept. of Pharmacology.

Abstract: Predicted pulmonary ozone (O3) dose curves obtained by model analysis of the transport and removal of O3 in the lungs of guinea pigs, rabbits, and man indicate that a general similarity exists among these species in the shapes of the dose curves. An overview of the major features of the lower airway mathematical model used is presented. This model predicts that the respiratory bronchioles receive the maximum O3 dose. For exposures corresponding to tracheal O3 concentrations greater than 100 micrograms/cu m (0.05 ppm), the predicted respiratory bronchiolar dose for rabbits was found to be twice that for guinea pigs and 80% of that for man. Sensitivity analyses are presented for model parameters relating to the treatment of the chemical reactions of O3 with the mucous layer. The role of tidal volume in the determination of pulmonary uptake of O3 in man is examined. The consistency and similarity of the dose curves for the three species lend strong support to the validity of extrapolating to man the results obtained on animals exposed to O3.

Descriptors: *Ozone, *Lung, *Toxicology, Humans, Laboratory animals, Mathematical models, Respiratory system, Transport properties, Removal, Guinea pigs, Rabbits, Dosage, Exposure, Sensitivity, Validity, Extrapolation, Deposition

Identifiers: *Animal models, *Dose response relationships, NTISEPAORD

PB-290 089/2ST NTIS Prices: PC A02/MF A01

INREM II: A Computer Implementation of Recent Models for Estimating the Dose Equivalent to Organs of Man from an Inhaled or Ingested Radionuclide

Oak Ridge National Lab., Tenn.*Department of Energy. (4832000)

AUTHOR: Killough, G. G.; Dunning, D. E. Jr; Pleasant, J. C.
E2713A1 Fld: 6R, 57V GRAI7825
2 Feb 78 101p
Contract: W-7405-ENG-26
Monitor: 18

Abstract: This report describes a computer code, INREM II, which calculates the internal radiation dose equivalent to organs of man which results from the intake of a radionuclide by inhalation or ingestion. Deposition and removal of radioactivity from the respiratory tract is represented by the ICRP Task Group Lung Model. A four-segment catenary model of the GI tract is used to estimate movement of radioactive material that is ingested or swallowed after being cleared from the respiratory tract. Retention of radioactivity in other organs is specified by linear combinations of decaying exponential functions. The formation and decay of radioactive daughters is treated explicitly, with each radionuclide species in the chain having its own uptake and retention parameters, as supplied by the user. The dose equivalent to a target organ is computed as the sum of contributions from each source organ in which radioactivity is assumed to be situated. This calculation utilizes a matrix of S-factors (rem/ mu Ci-day) supplied by the user for the particular choice of source and target organs. Output permits the evaluation of crossfire components of dose when penetrating radiations are present. INREM II is coded in FORTRAN IV and has been compiled and executed on an IBM-360 computer. (ERA citation 03:045402)

Descriptors: *Computer codes, *Gastrointestinal tract, *Lungs, *Organs, *Radiation doses, *Radioisotopes, *Radionuclide kinetics, Computer calculations, I codes, Ingestion, Inhalation, Man, Mathematical models, Retention functions, Tissue distribution

Identifiers: ERDA/560161, ERDA/560171, NTISDE

ORNL/NUREG/TM-84 NTIS Prices: PC A06/MF A01

Gas Exchange under Environmental Stress

Washington Univ Seattle (370200)

Final rept. 4 Nov 75-3 Feb 78
AUTHOR: Modell, Harold I.; Hlastala, Michael P.
E2553K1 Fld: 6S, 57W GRAI7824
Jul 78 72p
Contract: F41609-76-C-0016
Project: 7903
Task: 11
Monitor: SAM-TR-78-24

Abstract: The purpose of this project was threefold: (1) to assemble available information concerning the effects of various environmental factors such as altitude, acceleration, and breathing gas composition on gas exchange, (2) to initiate a mathematical simulation of gas exchange between atmosphere and tissues that would predict the effects of these factors on gas exchange at rest and during exercise, and (3) to identify areas for future experimental investigation. A computer model which includes a multi-compartment lung and lumped tissue beds representing brain, heart, muscle, and the remaining tissues was developed. Inputs are barometric pressure, inspired oxygen and carbon dioxide concentrations, carboxyhemoglobin concentration, acceleration in the z vector, and oxygen consumption. Steady state values are calculated for gas exchange parameters in the lungs and in the four tissue compartments. The simulation is designed in a modular fashion to enhance the ability to modify it as additional experimental data become available. The model provides qualitatively accurate predictions of experimental data showing responses to a single stress. Extensive experimental data of responses to multiple stresses with which to compare model predictions are not available. Results with multiple stresses indicate that experimental work aimed at better definition of minute to minute control of ventilation is necessary.

Descriptors: *Gas exchange(Biology), *Stress(Physiology), *Breathing gases, Schematic diagrams, Altitude, Acceleration, Physiological effects, Mathematical models, Mathematical prediction, Tissues(Biology), Computerized simulation, Equations, Blood circulation, Oxygen, Carbon dioxide, Dissociation, Lung, Brain, Heart

Identifiers: Experimental data, NTISDODXA

AD-A058 242/9ST NTIS Prices: PC A04/MF A01

Assessments of Risk Following the Inhalation of Plutonium Oxide Using Observed Lung Clearance Patterns

UKAEA Reactor Group, Winfrith (England). Atomic Energy Establishment. (6405000)

AUTHOR: Ramsden, D.
E2404G2 Fld: 6R, 57V, 68F GRAI7822
Oct 77 20p
Monitor: 18
Available in microfiche only. U.S. Sales Only.

Abstract: Dose commitments and risk estimates for the inhalation of plutonium oxide are calculated using the lung clearance patterns observed at AEE Winfrith. These risks are compared with published data on risks arising from a lung clearance based on the ICRP Lung Model. (Atomindex citation 09:370407)

Descriptors: *Lung clearance, *Lungs, *Plutonium oxides, Comparative evaluations, Dose commitments, ICRP, Inhalation, Mathematical models, Radiation hazards, Recommendations, Risk assessment

Identifiers: ERDA/560171, ERDA/560161, Great Britain, Health risks, NTISINIS

AEEW-R-1118 NTIS Prices: MF A01

Calculation of the Individual and Population Doses on Danish Territory Resulting from Hypothetical Core-Melt Accidents at the Barsebaeck Reactor
AUTHOR: Hedemann Jensen, P.; Lundtang Petersen, E.; Thykier-Nielsen, S.; Heikel Vinther, F.
E1952G3 Fld: 6F, 6R, 57H, 57V, 77F, 68G, 68F, 97R GRAI7818
Oct 77 118p
Monitor: 18
Available in microfiche only. U.S. Sales Only.Translation: source information not available.

Abstract: Individual and population doses on Danish territory are calculated from hypothetical, severe core-melt accidents at the Swedish nuclear plant at Barsebaeck. The release fractions for these accidents are taken from WASH-1400. Based on parame ic studies, doses are calculated for very unfavourab'e, but not incredible weather conditions. The probability of such conditions in combination with wind direction towards Danish territory is estimated. Doses to bone marrow, lungs, GI-tract and thyroid are calculated using dose models developed at Risoe. These doses are found to be consistent with doses calculated with the models used in WASH-1400. (Atomindex citation 08:343469)

Descriptors: *Barsebaeck-1 reactor, *Radiation doses, Human populations, Bone marrow, Data, Fission products, Gastrointestinal tract, Lungs, Man, Mathematical models, Meltdown, Meteorology, Plumes, Probability, Radiation hazards, Thyroid

Identifiers: ERDA/220900, ERDA/210100, Translations, Denmark, Foreign countries, NTISINIS

RISO-356 NTIS Prices: MF A01

Exp 113 Insup(M) Radiocardiographic Measurements of Cardiopulmonary Parameters in Healthy Subjects and in Cardiac Patients

Jyvaskyla Univ. (Finland). Dept. of Physics. (3496800)
AUTHOR: Kuikka, J.
E1415F3 Fld: 6E, 57E GRAI7814
May 76 73p
Monitor: 18
Thesis.
Available in microfiche only. U.S. Sales Only.

Abstract: Single detector arrangements are used to measure heart radioactivity curves in healthy subjects and in patients with various heart failures. A method is developed from a modified gamma function to determire the cardiopulmonary parameters from the radiocardiograms: systemic flow, pulmonary flow, right to left shunting flow, left to right shunting flow, regurgitant fractions, stroke volume, atrial blood volumes, ventricular end-diastolic volumes, pulmonary blood volume and ejection fractions. The method is well suited to clinical routine and requires only a desk calculator or a mini-computer for data handling. The cardiopulmonary parameters were measured from 70 healthy subjects with following results: cardiac index 3.46+-0.72 l/min/m exp 2 , stroke index 49+-9 ml/b/m exp 2 , right atrial blood volume 35+-13 ml/m exp 2 , right ventricular end-diastolic volume 76+-15 ml/m exp 2 , pulmonary blood volume 250+-51 ml/m exp 2 , left atrial blood volume 41+-15 ml/m exp 2 , left ventricular end-diastolic volume 75+-15 ml/m exp 2 , right heart ejection fraction 0.64+-0.11, left heart ejection fraction 0.66+-0.12. These values agree closely with the data accumulated from more elaborate methods. (Atomindex citation 0(:340540)

Descriptors: *Blood circulation, *Cardiovascular diseases, *Cardiovascular system, Indium 113, Isomeric nuclei, Lungs, Man, Mathematical models, Radiocardiography, Tracer techniques

Identifiers: ERDA/550601, Finland, Humans, Patients, Diagnostic agents, Radiopharmaceutical agents, NTISINIS

JU-RR-76/2 NTIS Prices: MF A01

Aerin: A Computational Version of the ICRP Lung Model

California Univ., Livermore. Lawrence Livermore Lab.*Energy Research and Development Administration. (9500007)
AUTHOR: Powell, T. J.; Myers, D. S.; Parlagreco, J. R.; Haggin, G. L.
E0551A4 Fld: 6R, 9B, 57V, 62 GRAI7806
2 Aug 76 82
Contract: W-7405-ENG-48
Monitor: 18

Abstract: The computer program AERIN is a computational version of the model for the behavior of inhaled radionuclides developed by the International Commission on Radiological Protection (ICRP) Task Group on Lung Dynamics. To this end, the program will compute and plot the burden of radioactivity versus time in various portions of the lung and lymph nodes that result from chronic or acute inhalation of a radionuclide. In addition to describing the basic ICRP lung model, the program has been extended to compute the burden of inhaled plutonium deposited in the liver and bones that has been transported there via the lungs or lymph nodes and the rate of plutonium excretion via the urine and feces. Finally, the program will compute the average radiation dose delivered to each organ by the inhaled radionuclide. (ERA citation 03:005316)

Descriptors: *Computer codes, *Lungs, *Plutonium isotopes, Bone tissues, Dosimetry, Excretion, Icrp, Inhalation, Liver, Lymph nodes, Mathematical models, Radiation doses

Identifiers: ERDA/560161, *AERIN computer program, Radioactive isotopes, NTISERDA

UCID-17000 NTIS Prices: PC A05/MF A01

Age-Specific Radiation Dose Commitment Factors for a One-Year Chronic Intake

Battelle Pacific Northwest Labs., Richland, Wash.*Nuclear Regulatory Commission, Washington, D.C. Office of Standards Development. (401 048)
AUTHOR: Hoenes, G. R.; Soldat, J. K.
F0504K1 Fld: 6R, 57V, 68F GRAI7806
Nov 77 112p
Monitor: NUREG-0172

Abstract: Age dependent dose conversion factors for internal radiation exposure via inhalation or ingestion are computed and tabulated. Results are presented in units of millirem received over a 50-year dose commitment interval per picocurie inhaled or ingested. Four age groups and seven target organs are considered using calculational models presented in the International Commission on Radiological Protection (ICRP) 1959 Report of Committee 2, as updated by ICRP Reports 6 and 10.

Descriptors: *Radiation dosage, Bones, Liver, Thyroid gland, Kidney, Dosimetry, Age, Mathematical models, Exposure, Dosage, Dose rate, Radioactive isotopes, Tables(Data), Ingestion(Physiology), Respiration, Infants, Children, Adults, Lung, Gastrointestinal system

Identifiers: Age groups, *Dose commitments, Teenagers, Biological half life, Organs(Anatomy), NTISNUREG

PB-275 348/1ST NTIS Prices: PC A06/MF A01

A Further Appraisal of Dosimetry Related to Uranium Mining Health Hazards

Battelle-Northwest, Richland, Wash.*National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Div. of Field Studies and Clinical Investigations.
AUTHOR: Nelson, I. C.; Parker, H. M.
E0324J3 Fld: 6J, 6R, 57U, 57V, 94D, 68G, 68F GRAI7804
Apr 74 112p
Contract: PHS-CPE-69-131
Monitor: DHEW/PUB/NIOSH-74/106

Abstract: The report discusses uranium miner lung dosimetry in terms of: characterization of mine atmospheres; lung model and breathing patterns; deposition of radon daughters in the respiratory system; regional translocation and equilibrium activities; and target tissue and dose. Methods are compared for estimating the cancer related dose imparted to the basal cells of the bronchial epithelium resulting from the deposition of alpha emitting daughters of radon-222 on surfaces of the tracheobronchial tree.

Descriptors: *Industrial hygiene, *Radiation dosage, *Ionizing radiation, *Radioactive isotopes, *Pulmonary neoplasms, Dosimetry, Malignant neoplasms, Tables(Data), Respiratory diseases, Recommendations, Respiratory system, Lung, Mathematical models, Industrial atmospheres, Environmental surveys, Uranium ores, Actinide series, Radon isotopes, Carcinogens, Health physics

Identifiers: *Uranium mining, Carcinogenesis, *Cancer, Environmental health, *Occupational safety and health, NTISHEWOSH

PB-274 189/OST NTIS Prices: PC A06/MF A01

Theoretical Analysis of the Measurement of Lung Tissue Volume by Rebreathing and Its Application to the Measurement of Rebreathing Dead Space

Rochester Univ., N.Y. Dept. of Radiation Biology and Biophysics.*Energy Research and Development Administration. (5540000)
AUTHOR: Petrini, M. F.
D3871F4 Fld: 6P, 57S GRAI7726
1977 220p
Contract: EY-76-C-02-3490
Monitor: 18
Thesis.

Abstract: Fast responding mass spectrometers are now available that can continuously monitor respiratory gases during rebreathing. These measurements permit rapid, non-invasive determinations of pulmonary tissue volume (V/sub t/) and pulmonary capillary blood flow (Q/sub c/). The factors that may influence these measurements in man were studied in detail using a mathematical model to study the effect of various forms of uneven distribution on rebreathing measurements of V/sub t/ and Q/sub c/. (ERA citation 02:046523)

Descriptors: *Blood flow, *Lungs, *Respiration, *Respiratory system, Anatomy, Biological models, Breath, Capillaries, Man, Mass spectroscopy, Mathematical models, Measuring methods, Physiology, Tissues, Variations, Volume

Identifiers: ERDA/551000, Lung function tests, Noninvasive tests, NTISERDA

UR-3490-1136 NTIS Prices: PC A10/MF A01

Cardiovascular and Pulmonary Dynamics by Quantitative Imaging

Mayo Foundation Rochester Minn Dept of Physiology and Biophysics (408960)
AUTHOR: Wood, Earl H.
D3765B1 Fld: 6B, 6P, 95C, 57S GRAI7726
1976 11p
Contract: F44620-71-C-0069
Grant: PHS-HL-4664
Project: 2312
Task: A2
Monitor: AFOSR-TR-77-1164
Availability: Pub. in Circulation Research, v38 n3 p131-139 Mar 76.

Abstract: The authors describe applications of mathematical approaches including the algebraic reconstruction algorithm for cross-sectional reconstruction from multi-planar x-rays of biological structures and discuss future biomedical applied and research possibilities. (Author)

Descriptors: *Images, *Scanning, *X ray diagnostics, *Cardiovascular system, *Blood circulation, *Computer aided diagnosis, Mathematical models, Three dimensional, Human body, Dynamics, Heart, Algorithms, Algebraic functions, Lung, Cross sections, Reprints

Identifiers: Cross sectional reconstruction, Three dimensional spatial reconstruction, *Medical computer applications, NTISDODXR

AD-A045 150/OST NTIS Prices: PC A02/MF A01

Cardiac Output Determination by Simple One-Step Rebreathing Technique

State Univ of New York At Buffalo Dept of Physiology (256910)
AUTHOR: Farhi, L. E.; Nesarajah, M. S.; Olszowka, A. J.; Metildi, L. A.; Ellis, A. K.
D3574K4 Fld: 6P, 6L, 57S, 95C GRAI7724
10 Jun 76 21p
Contract: F44620-72-C-0009
Grant: PHS-HL-14414
Project: 2312
Monitor: AFOSR-TR-77-1163
Presented at the Annual Meeting of the Federation of American Societies for Experimental Biology, 1975.
Availability: Pub. in Respiration Physiology, v28 p141-159 1976.

Abstract: A rebreathing technique was developed to measure cardiac output in resting or exercising subjects. The data needed are the subject's CO2 dissociation curve, the initial volume and CO2 fraction of the rebreathing bag, and a record of CO2 at the mouth during the maneuver. From these one can obtain all the values required to solve the Fick equation. The combined error due to inaccuracy in reading the tracings and to the simplifying assumptions was found to be small (mean = 0.5%, SD = 2.5%). Cardiac output values determined with this technique in normal subjects were on the average 2% higher than those obtained simultaneously with an acetylene rebreathing method (n=49, SD=11%). Among the advantages of this technique are that it requires analysis of a single gas, takes less than thirty seconds per determination, allows one to obtain repeated measurements at rapid intervals, is not affected by the ability of lung tissue to store CO2, and eliminates many of the assumptions usually made in non-invasive measurements of cardiac output.

Descriptors: *Pulmonary blood circulation, *Gas exchange(Biology), Carbon dioxide, Bioinstrumentation, Medical equipment, Breathing apparatus, Lung, Alveoli, Breathing gases, *Diffusion, Mathematical models, Cardiography, Rest, Exercise(Physiology), Monitors, Reprints

Identifiers: *Cardiac output, Rebreathing systems, Fick law, NTISDODXR

AD-A044 085/9ST NTIS Prices: PC A02/MF A01

A Fluid-Mechanical Model of the Thoraco-Abdominal System with Applications to Blast Biology

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212 000)
Technical progress rept.
AUTHOR: Bowen, I. Gerald; Holladay, April; Fletcher, E. Royce; Richmond, Donald R.; White, Clayton S.
D2755F4 Fld: 6S d7716
14 Jun 65 75p
Contract: DA49 146XZ055
Monitor: DASA-1675
Distribution limitation now removed.

Abstract: A mathematical model was described which was developed to compute some of the fluid-mechanical responses of the thoraco-abdominal system subjected to rapid changes in environmental pressure. Parameters relating the animal to the model were estimated, tested and then adjusted as required by comparing model results with experimental records of thoracic pressures recorded for rabbits exposed to blast waves in shock tubes. Equations were derived to scale parameters applicable to a given animal to those for similar creatures of arbitrary mass. By dimensional analysis other equations were developed to relate, for a given biological response, the body mass of similar animals to blast wave parameters. Numerical solutions of the model were presented to help explain the mechanisms involved when animals were loaded with typical wave forms or with pulses increasing to a maximum in a stepwise manner, a contingency associated with a quite significant increase in mammalian tolerance to overpressure. Differences in response to short- and long- duration blast waves were noted. Applications of the scaling concepts were exemplified in several ways making use of the published data in blast biology. (Author)

Descriptors: (*Blast, Shock(Pathology)), Tolerances(Physiology), Mathematical models, Abdomen, Thorax, Pressure, Shock waves, Hemorrhage, Embolism, Lung, Volume, Fluid mechanics, Theory, Decompression, Laboratory animals, Biophysics, Body weight, Damping, Anatomical models

Identifiers: Biodynamics, *Stress(Physiology), NTISDODYD

AD-469 913/8ST NTIS Prices: PC A04/MF A01

Development and Evaluation of Cardiac Prostheses

Cleveland Clinic Foundation, Ohio. Dept. of Artificial Organs.*National Heart and Lung Inst., Bethesda, Md.

Annual rept. Jun 75-Mar 76
AUTHOR: Nose, Y.; Kiraly, R.; Jacobs, G.; Koshino, I.; Morinaga, N.
D2225B3 Fld: 6L, 95A GRAI7712
Mar 76 230p
Contract: NO1-HV-4-2960
Monitor: NIH-NO1-HV-4-2960-2
See also PB-245 272.

Abstract: The objective of this contract is to develop and evaluate a left ventricular assist pump (LVAD) and total heart replacement (TAH). All of the blood contacting surfaces are biolized, having either chemically-treated natural tissue or protein coatings. Tri-leaflet valves fabricated from human dura mater and bovine aortic valves are used. The pumping diaphragms are made from a polyolefin rubber having a high flex life. Anticoagulants are not used with these pumps. The most serious technical problem experienced this year has been the failure of diaphragms in vivo traced to minute voids in the molded rubber diaphragms and solved by changes in the mold. No subsequent failures have occurred. A porous surface was incorporated into the blood side of the diaphragm to allow biolization and attachment of a stabilized pseudoneointima. Currently, chronic LVAD and TAH animals are surviving as long as 10 and 14 weeks respectively. A study of anemia showed that this symptom is not specific to the TAH. Mathematical modeling of a single-ventricle artificial heart model was completed, and verified with in vitro tests, while in vivo validation is now underway. Studies of human anatomy relevant to LVAD applications has been initiated utilizing data from living patients.

Descriptors: *Mechanical hearts, *Prosthetic devices, Mechanical organs, Design, Medical equipment, Evaluation, Tables(Data), Mathematical models, Laboratory animals, In vitro analysis, In vivo analysis, Anatomy, Cattle, Blood circulation, Heart, Surgical implantation, Mathematical models

Identifiers: *Cardiac assist devices, Ventricular assistance, *Blood pumps, Biomaterials, Left ventricular assist device, NTISNIHHLI

PB-264 771/7ST NTIS Prices: PC A11/MF A01

Explosion Effects Computation Aids

General American Transportation Corp Niles Ill General American Research Div (400 306)

Final rept. 15 Nov 71-30 Jun 72
AUTHOR: Fugelso, L. E.; Weiner, L. M.; Schiffman, T. H.
C7325G4 Fld: 19D, 19A d7622
Jun 72 59p
Contract: DAHC04-72-C-0012
Project: GARD-1540
Monitor: 18
Distribution limitation now removed.

Abstract: Computational aids for the rapid assessment of potential hazards from blast and fragments during the accidental detonation of stored munitions were prepared. Four munitions, the MK82 500-lb bomb, the M117 750-lb bomb, the M107 155-mm shell and the M437A2 175-mm shell, stored in module type open barricaded pads, in above ground magazines and in standard earth covered igloos were considered. Targets considered included personnel standing in the open, frame structures, and unarmored military vehicles. For the blast damage, this information is presented on a circular slide rule; for fragment damage, the information is presented in graphical form. (Author)

Descriptors: (*Explosion effects, Mathematical models), Detonations, Accidents, Antipersonnel ammunition, Blast, Shock waves, Heat, Fragmentation, Fragmentation ammunition, Bombs, Cartridges, Storage, Revetments, Configuration, Intensity, Hazards, Glass, Ammunition fragments, Army personnel, Wounds and injuries, Ammunition damage, Computers, Mathematical prediction, Structures, Shelters, Vehicles, Human body, Head(Anatomy), Lung, Ear, Tables(Data), Pressure, Graphics

Identifiers: Circular slide rules, Mark-82 bombs(500-lb.), M-107 cartridges(155-mm), M-117 bombs(750-lb.), M-437 cartridges(175-mm), M-437a2 cartridges(175-mm), NTISDODXD

AD-903 279/8ST NTIS Prices: PC A04/MF A01

Flatus Mixed-Gas Scuba

Navy Experimental Diving Unit Washington D C (253 650)

Final rept.
AUTHOR: Dwyer, J. V.
C7312F3 Fld: 6K d7622
1 Nov 54 18p
Rept No: NEDU-Formal-13-54
Project: NS-186-200
Monitor: 18
Distribution limitation now removed.

Abstract: The flatus was tested by a series of dives on different mixtures injected at various rates. The evaluation produced the following conclusions: (1) The apparatus was found to conform to predicted performance for its basic class; consequently it can perform satisfactorily for any type of diving within depth and time limits for the mixture used; (2) It can meet interim UDU and EODU requirements; (3) It could become the safest mixed-gas apparatus available; (4) It should be made sturdier and then be evaluated for its maximum capabilities; (5) It should be given full-scale field for UDU and EODU use. (Author)

Descriptors: (*Breathing apparatus, Diving), Feasibility studies, Respiration, Lung, Models(Simulations), Mathematical models, Respirators, Gases, Mixtures, Life support, Closed ecological systems, Scuba divers, Safety

Identifiers: Flatus diving equipment, Flatus, NTISDODXD

AD-893 934/OST NTIS Prices: PC A02/MF A01

Influenza Virus Population Dynamics in the Respiratory Tract of Experimentally Infected Mice

Army Medical Research Inst of Infectious Diseases Frederick Md (405039)
AUTHOR: Larson, Edgar W.; Dominik, Joseph W.; Rowberg, Alan H.; Higbee, Glen A.
C6532H4 Fld: 6E, 6M, 57K GRAI7613
3 Jul 75 10p
Monitor: 18
Availability: Pub. in Infection and Immunity, v13 n2 p438-447 Feb 76.

Abstract: Virus population dynamics in the lungs, trachea, and nasopharynx of Swiss-ICR mice were studied after respiratory challenge with mouse-adapted preparations of strain A2/Aichi/2/68 influenza virus. Markedly higher doses of virus were required to produce infection with nasopharyngeal challenge than with bronchoalveolar challenge. In all of the infections, the highest virus concentrations were observed in the lungs. Peak concentrations in the trachea were lower than in the lungs but higher than in the nasopharynx. Decreasing virus levels were observed by 120 h after challenge and were generally below detectable levels by the end of 10 days. A compartmental model of a single mathematical form was developed which provided close fits of the virus concentration measurements regardless of the challenge dose, site of initial deposition, or respiratory tissue considered. The model includes seven compartments with five associated rate parameters. The application of compartmental modeling techniques and expression of the virus population dynamics in mathematical terms in regarded as a new approach to the study of the pathogenesis of infections. (Author)

Descriptors: *Influenza virus, *Respiratory system, Mice, Nose(Anatomy), Lungs, Comparison, Trachea, Pathogenesis, Bronchi, Mathematical models, Alveoli, Dose rate, Compartments, Reprints

Identifiers: *Virus population dynamics, Nasopharynx, NTISDODXR, NTISDODA

AD-A023 701/6ST NTIS Prices: PC A02/MF A01

Heat and Mass Transfer in the Human Respiratory Tract at Hyperbaric Pressures

Duke Univ Durham N C School of Engineering (403627)

Technical rept.
AUTHOR: Linderoth, L. Sigfred Jr; Kuonen, Ernest A.
C6243K4 Fld: 6S, 20M, 57W GRAI7610
May 73 277p
Contract: N00014-67-A-0251-0018
Project: NR-201-148
Monitor: 18

Abstract: The primary objective of this study is to model the simultaneous heat and momentum transfer in the lower respiratory tract. Experimental velocity and temperature profiles are presented in two and three dimensional format. A computer program to calculate gas transport properties for any gas mixture at any pressure was developed. Methods to measure humidity at depth are also discussed. The respiratory heat loss of a diver working at 1000+ feet is discussed. Finally data from this study are compared with the sparse data available in the literature and with data from experiments performed under simulated diving conditions. Suggestions are made for continuing and additional studies in the field of respiratory heat loss.

Descriptors: *Respiratory system, *Hyperbaric conditions, Momentum transfer, Heat transfer, mathematical models, Temperature, Computerized simulation, Velocity, Thermal conductivity, Computer programs, Humidity, Scuba divers, Breathing gases, Helium, Oxygen, Flow rate, Lung , Hyperbaric chambers, Statistical analysis, Enthalpy, Transport properties

Identifiers: Software, NTISDODXA, NTISDODN

AD-A021 966/7ST NTIS Prices: PC A13/MF A01

Effects of Sulfur Oxides on the Lung: An Analytic Base. Part II - Appendix

Science Applications, Inc., El Segundo, Calif.*Electric Power Research Inst., Palo Alto, Calif. (407 842)
AUTHOR: Hausknecht, D. F.; Ziskind, R. A.
C6195J1 Fld: 06T, 57Y, 68G GRAI7609
Sep 75 148p*
Rept No: SAI-75-566-LA
Project: EPRI-205
Monitor: EPRI-205A
See also report dated Sep 75, PB-246 258.

Abstract: The workshop panel was comprised of experts in sulfur oxide toxicology, pulmonary medicine, mathematical modeling of the respiratory system, including detailed morphometry, and cytology. Each of the reviewers was provided a copy of the Report in draft several weeks before the workshop which was conducted November 25 and 26, 1974 at EPRI Headquarters in Palo Alto. The reviewers were requested to comment on the validity and adequacy of the approach described in achieving the goals stated in the Report. The written reviews provided by the workshop participants are reproduced in this report.

Descriptors: *Sulfur oxides, *Lung, *Respiratory system, *Toxicology, Public health, Particles, Mathematical models, Physiology, Laboratory animals, Experimental data, Reviews, Cytology, Histology

Identifiers: Environmental health, Air pollution effects(Humans), Air pollution effects(Animals), NTISEPRI

PB-249 685/9ST NTIS Prices: PC A07/MF A01

Heat and Mass Transfer in the Human Respiratory Tract at Hyperbaric Pressures

Duke Univ Durham N C School of Engineering*Office of Naval Research, Arlington, Va. (403627)

Final rept. 1 Apr 72-31 Dec 74
AUTHOR: Linderoth, L. Sigfred Jr; Kuonen, E. A.; Nuckols, M. L.; Johnson, C. E.
C6073J3 Fld: 6S, 57W GRAI7608
Nov 75 82p
Contract: N00014-67-A-0251-0018
Project: NR-201-148
Monitor: 18
See also report dated May 73, AD-771 370.

Abstract: The objective of the project was to mathematically model the heat loss process that occurs in the respiratory tracts under deep ocean saturation diving conditions. This was approximated by determining the heat transfer characteristics of a branching scale model of the first two branches of the human lower respiratory tract. Heat transfer coefficients were obtained for a range of respiratory rates and respiratory gas mixtures for simulated ocean depths 0 to 1000 feet. These heat transfer coefficients were used to predict the heat loss from the respiratory tract of a diver by the successive application of the branching model, appropriately scaled, to simulate progressive units of the lung's anatomical configuration.

Descriptors: *Respiratory system, *Heat transfer, *Hyperbaric conditions, *Stress(Physiology), Mass transfer, Barometric pressure, Mathematical models, Humans, Tables(Data), Lung, Gases, Deep diving, Experimental data

Identifiers: NTISDODN

AD-A021 146/6ST NTIS Prices: PC A05/MF A01

Pulmonary Mechanics by Spectral Analysis of Forced Random Noise

School of Aerospace Medicine Brooks AFB Tex (317000)

Final rept. Jan 73-Aug 74
AUTHOR: Michaelson, Edward D.; Grassman, Eric D.; Peters, Wendell R.
C577513 Fld: 6E, 57S GRAI7604
31 Jul 74 24p
Rept No: SAM-TR-74-424
Grant: AF-AFOSR-2074-71
Project: AF-7930
Task: 793003
Monitor: 18
Availability: Pub. in the Jnl. of Clinical Investigation, v56 n5 p1210-1230 Nov 75.

Abstract: The magnitude Z sub rs and phase angle theta sub rs of the total respiratory impedance Z sub rs, from 3 to 45 Hz, were rapidly obtained by a modification of the forced oscillation method, in which a random noise pressure wave is imposed on the respiratory system at the mouth and compared to the induced random flow using Fourier and spectral analysis. No significant amplitude errors or phase shifts were introduced by the instrumentation. Nine normals (NL), 5 smokers (SM), and 5 patients with chronic obstructive lung disease (COPD) were studied. Measurements of Theta sub rs were corrected for the parallel shunt impedance of the mouth, which was independently measured. Z sub rs in NL and SM behaves approximately like a second order system with Theta sub rs - 0 degrees in the range of 5 to 9 Hz and Theta sub rs in the range of +40 deg at 20 Hz and +60 degrees at 40 Hz. In COPD, Theta sub rs remains more negative (compared to NL and SM) at all frequencies. Changes in Z sub rs, similar to those seen in COPD, were also observed at low lung volumes in NL. These changes, the effects of a bronchodilator in COPD, and deviations of Z sub rs from second order behavior in NL, can best be explained by a 2 compartment parallel model, in which time constant discrepancies between the lung parenchyma and compliant airways keep compliant greater than inertial reactance, resulting in a more negative phase angle as frequency is increased.

Descriptors: *Pulmonary function, *Noise(Sound), *Lungs, Random vibration, Fourier analysis, Spectrum analysis, Mathematical models, Respiratory system, Frequency, Respiratory diseases, Impedance, Plethysmography, Spirometry, Anthropometry, Reprints

Identifiers: Forced oscillation method, NTISDODXR, NTISDODAF

AD-A018 824/3ST NTIS Prices: PC A02/MF A01

Effects of Sulfur Oxides on the Lung: An Analytic Base. Part I

Science Applications, Inc., El Segundo, Calif.•Electric Power Research Inst., Palo Alto, Calif.

Final rept.
AUTHOR: Hausknecht, D. F.; Ziskind, R. A.
C5734F4 Fld: 06T, 06F, 13B, 57Y•, 68G•, 68A GRAI7603
Sep 75 216p•
Project: EPRI-205
Monitor: EPRI-205-Pt-1

Abstract: The data on health effects of sulfur oxide pollutants are composed of information from epidemiological studies, clinical measurements, and laboratory experiments. One of the primary values of laboratory data is in illuminating the mechanisms linking respiratory challenge and responses. A considerable body of these data exist, however, the wide variety of physical, chemical, and temporal characteristics of sulfur oxide challenges and the variety of respiratory characteristics of different animal species cause inter-comparisons of experiments to be qualitative and incomplete in general. The present study is the first step toward development of a quantitative theoretical framework for improving the utilization of available experimental data.

Descriptors: •Sulfur oxides, •Toxicology, Exposure, Epidemiology, Air pollution, Objectives, Recommendations, Response, Mathematical models, Tables(Data), Experimental data, Respiratory system, Lung, Physiological effects, Pathology, Laboratory animals, Bronchitis, Respiratory diseases, Emphysema, Dosage

Identifiers: •Environmental health, Air pollution effects(Animals), Animal models, NTISEPRI

PB-246 258/8ST NTIS Prices: PC A10/MF A01

Some Implications of Ternary Diffusion in the Lung

State Univ of New York At Buffalo•Office of Naval Research, Arlington, Va.•Public Health Services, Washington, D.C. (256940)
AUTHOR: Chang, Hsin-Kang; Tai, Ronald C.; Farhi, Leon E.
C5581E1 Fld: 6P, 6E, 57S GRAI7601
3 Oct 74 12p
Contract: N00014-68-A-0216
Grant: PHS-HL-14414
Project: NR-101-722
Monitor: 18
Availability: Pub. in Respiration Physiology, 23 p109-120 1975.

Abstract: Diffusion in the lung normally involves three gases and the governing laws are Stefan-Maxwell equations rather than the more familiar Fick's law. A simple gas film model is studied mathematically to (1) demonstrate that the rate of diffusion of a component gas may be zero even though its concentration gradient is not zero (known as 'diffusion barrier'), that the rate of diffusion of a component gas may not be zero even though its concentration gradient is zero ('osmotic diffusion'), and that a component gas may diffuse against the gradient of its concentration ('reverse diffusion'); (2) compare the discrepancy between results obtained by binary and ternary laws separately; (3) determine the importance of ternary diffusion at high pressure. The findings from the model study suggest that the effects of ternary diffusion may not be pronounced when air is breathed under normal conditions, but the behavior of helium mixtures deviate significantly from that described by binary diffusion laws. (Author)

Descriptors: •Gas exchange(Biology), •Lung, •Diffusion, High pressure, Helium, Pulmonary function, Transport properties, Mathematical models, Gas flow, Rates, Barriers, Air, Breathing gases, Mixtures, Mass transfer, Reprints

Identifiers: Ternary systems, NTISDODXR, NTISDODN

AD-A017 253/6ST NTIS Prices: PC A02/MF A01

Thoracic Impact Injury Mechanism. Volume I

Franklin Inst. Research Labs., Philadelphia, Pa.*National Highway Traffic Safety Administration, Washington, D.C. (142 925)

Final rept. Jul 72-Dec 74
AUTHOR: Reddi, M. M.; Tsai, H. C.; Wendt, F. W.; Rogers, V. A.; Erb, R. A.
C5551H1 Fld: 06S, 57O, 57W, 85D GRAI7526
Aug 75 234p
Rept No: F-C3417-Vol-1
Contract: DOT-HS-243-2-424
Monitor: DOT-HS-801-710
See also Volume 2, PB-245 429.

Abstract: Mathematical modeling and related computer program development for the thorax under impact conditions are described. An experimental program for measuring thoracic behavior of Rhesus Monkeys under impact conditions by means of bi-planar cine-radiography is also described. Preparation of an anatomical cross-section atlas for Rhesus Monkey is discussed. Results of the computer program are compared to experimental data for a human thorax and are found to be satisfactory.

Descriptors: *Thorax, *Impact, *Injuries, *Biodynamics, Radiography, Mathematical models, Motion pictures, Experimental data, Monkeys, Bronchi, Respiratory system, Diaphragm(Anatomy), Esophagus, Lung, Mechanical properties, Stress(Physiology), Ribs(Bones), Blood vessels

Identifiers: DOT/5A, *Biomechanics, NTISDOTHTS

PB-245 399/1ST NTIS Prices: PC A11/MF A01

Development and Evaluation of Cardiac Prostheses

Cleveland Clinic Foundation, Ohio. Dept. of Artificial Organs.*National Heart and Lung Inst., Bethesda, Md. Devices and Technology Branch.

Annual rept. Jun 74-May 75
AUTHOR: Nose, Y.; Krialy, R.; Jacobs, G.; Arancibia, C.; Nakiri, K.
C5545J1 Fld: 06L, 95A GRAI7526
May 75 190p
Contract: NO1-HV-4-2960
Monitor: NIH-NO1-HV-4-2960-1

Abstract: The project involves the development and evaluation of left ventricular assist pumps and total artificial hearts utilizing biolized materials on the blood contacting surfaces. Tri-leaflet valves fabricated from human dura mater and diaphragms compression molded of Hexsyn, a high flex life rubber are used in both applications. During the current contract year, pneumatically driven devices were designed, fabricated, and evaluated in vitro and in vivo. Animal survival of up to 24 days with the first developmental total hearts indicated a feasible design. Acute experiments up to 3 days with the assist pump showed capability to pump the entire cardiac output while significantly lowering the left ventricular pressure. A mathematical model of the hemodynamics associated with a total artificial heart has been initiated to aid in the development of devices and control methods. The model shows excellent prediction of in vitro performance obtained with a unique apparatus utilizing the natural atria and vena cava removed from calves.

Descriptors: *Mechanical hearts, *Prosthetic devices, Design specifications, Medical equipment, Evaluation, Mathematical models, In vitro analysis, In vivo analysis, Anatomy, Cattle, Blood circulation, Heart, Surgical implantation

Identifiers: *Cardiac assist devices, Ventricular assistance, *Blood pumps, Biomaterials, NTISNIHHLI

PB-245 272/0ST NTIS Prices: PC A09/MF A01

Stochastic Relationships for Neurons and Neuron Pair Networks

California Univ Los Angeles School of Engineering and Applied Science•Office of Naval Research, Arlington, Va.•National Heart and Lung Inst., Bethesda, Md. (404637)
AUTHOR: Ward, Denham Salisbury
C5362L2 Fld: 6P, 57S GRAI7524
Aug 75 165p
Rept No: UCLA-ENG-7564
Contract: N00014-69-A-0200-4041, N00014-75-C-0609
Monitor: 18
Sponsored in part by Grant PHS-HL-15659.

Abstract: The report discusses mathematical models for neurons and neuron pair networks. Models are developed in which the parameters are related to basic physiological properties. Mechanisms for the generation of spike trains with interspike interval correlations (a nonrenewal processes) in neuron pair networks are studied. Analytical results are obtained to statistically describe spike trains generated by these networks.

Descriptors: •Nerve cells, •Neural nets, Nervous system, Mathematical models, Nerve impulses, Nerve transmission, Stochastic processes

Identifiers: •Neurophysiology, NTISDODN, NTISNIH

AD-A015 338/7ST NTIS Prices: PC A08/MF A01

Dacrin: A Computer Program for Calculating Organ Dose from Acute or Chronic Radionuclide Inhalation: Modification for Gastrointestinal Tract Dose

Battelle Pacific Northwest Labs., Richland, Wash. (9500022)
AUTHOR: Strenge, D. L.
C5054H2 Fld: 6R, 57V, 57E NSA3201
Feb 74 125p
Contract: AT(45-1)-1830
Monitor: 18

Abstract: The computer program DACRIN was used with the lung model proposed by the ICRP Task Group on Lung Dynamics to calculate the effective dose to the respiratory tract and other organs following either acute or chronic inhalation of radionuclides. The computer program has been expanded to calculate doses to the G. I. tract compartments using the lung model as the input mechanism.

Descriptors: (•Man, •Radiation doses), (•Lungs, Radiation doses), (•Gastrointestinal tract, Radiation doses), (•Computer codes, •D codes), Acute irradiation, Biological models, Chronic irradiation, Computer calculations, Inhalation, Internal irradiation, Mathematical models, Radioisotopes, Radionuclide kinetics

Identifiers: NTISERDA

BNWL-B-389(Supp.) NTIS Prices: PC A06/MF A01

Effects of Feedback Delay Upon the Apparent Damping Ratio of the Avian Respiratory Control System

Ohio State Univ Columbus Dept of Physiology•Office of Naval Research, Arlington, Va.•National Heart and Lung Inst., Bethesda, Md.•Medical Coll. of Georgia, Augusta. Dept. of Physiology. (409235)
AUTHOR: Kunz, Albert L.; Miller, David A.
C4701I4 Fld: 6P, 57S GRAI7514
1974 11p
Contract: N00014-67-A-0232-0002
Grant: PHS-HL-14870-02
Project: Nr.101-733
Monitor: 18
Availability: Pub. in Respiration Physiology, 22 p179-189 1974.

Abstract: Experiments were performed in unidirectionally ventilated chickens as described by Kunz and Miller (1974), in which the feedback signal usually derived from intrapulmonary CO2-sensitive receptors could be manipulated using a computer. This computer-chicken combination resulted in a stable system. Transient responses to test pulses of CO2 gave second responses. Delay added to the computer feedback loop decreased the damping ratio of the system. A mathematical theory of the effect of this delay on a second order system is presented. A close correlation between theory and experimental results suggests that the bird-computer system tested is of second order. Since the integrator in the computer adds an order to the system, the bird's controller is assumed to be first order. (Author)

Descriptors: •Respiration, Control, Chickens, Feedback, Delay, Ventilation(Physiology), Carbon dioxide, Damping, Response(Biology), Instability, Plethysmography, Gas exchange(Biology), Computer applications, On line systems, Mathematical models, Time series analysis, Reprints

Identifiers: Cheyne-stokes respiration, NTISDODN

AD-A009 617/2ST NTIS Prices: PC A02/MF A01

Source Book on Plutonium and Its Decontamination

Field Command(dna) Kirtland AFB N Mex (407605)

Topical rept.
AUTHOR: Cobb, F. C.; Van Hemert, R. L.
C4075L4 Fld: 6R, 57V*, 68G* GRAI7505
24 Sep 73 91p
Monitor: DNA-3272T

Abstract: ;Contents: The plutonium hazard; Review of U.S. policy and direction concerning plutonium contamination; Physical parameters of plutonium contamination; The biology of plutonium contamination; The deposition and retention of inhaled plutonium in the human body; Foreign plutonium decontamination standards; Reduction of plutonium contamination hazard.

Descriptors: *Plutonium, *Decontamination, *Radioactive contamination, Physical properties, Hazards, Dispersions, Standards, Radiation effects, Radiation hazards, Radiation injuries, Therapy, Chemotherapy, Lung, Mathematical models

Identifiers: Body burdens, NTISDODAF

AD/A-003 413/2ST NTIS Prices: PC A05/MF A01

* Estimate of Maximum Expiratory Flow Based on the Equal Pressure Point Concept and Weibel's Lung Model

Duke Univ Medical Center Durham N C F G Hall Lab for Environmental Research (406717)
AUTHOR: Haynes, James H.; Kylstra, Johannes A.
C3054L2 Fld: 6S GRAI7416
Jun 73 14p
Contract: N00014-67-A-0251-0007
Grant: PHS-HL-07896
Project: NR-201-030
Monitor: 18
Availability: Pub. in Undersea Biomedical Research, v1 n1 p45-68 p45-58 Mar 74.

Abstract: Using empirical flow equations from the engineering literature the authors have calculated expiratory pressure-flow relationships in Weibel's lung model. The computed maximum expiratory flow of air and oxygen-helium mixtures over a range of barometric pressures from 1 to 53 atmospheres was in good agreement with experimentally determined values. It is concluded that a diver's maximum expiratory flow at great depths can be estimated from measurements made at the surface and at shallow depths. (Modified author abstract)

Descriptors: *Respiration, *Pressure breathing, *Hyperbaric conditions, Mathematical models, Lung, Divers, Stress(Physiology)

Identifiers: NTISN

AD-780 150/9 NTIS Price: Reprint

Mortality in Rats Exposed to CW Microwave Radiation at 0.95, 2.45, 4.54, and 7.44 GHz

Stanford Research Inst Menlo Park Calif (332500)

Final rept. 1 Jul-31 Dec 73
AUTHOR: Polson, P.; Jones, D. C. L.; Karp, A.; Krebs, J. S.
C2501I1 Fld: 6R, 57V GRAI7409
Jan 74 94p
Rept No: SRI-2777-FR
Contract: DAAK02-73-C-0453
Project: SRI-2777
Monitor: 18

Abstract: Dose-response (lethality) data have been obtained for rats exposed frontally to CW microwave radiation in the frequency range 0.9 to 8 GHz. Approximately 1400 male rats of the Sprague-Dawley strain have been exposed groups to four separate frequencies: 0.95, 2.45, 4.54, and 7.44 GHz. Power density levels have ranged from approximately 0.2 W/sq cm to 12 W/sq cm, and lethal exposure durations from approximately 10 sec to 300 sec. Gross and histologic evaluation of selected tissues from some 20 animals has been obtained. The cause of death has been established as congestion, hemorrhage, and obstruction of nasal passages and/or congestion, hemorrhage, and often edema of the lungs. The lethality data have been subjected to a probit analysis, yielding LD50 curves for each of the four frequencies, and the LD50 values have been empirically fitted with a mathematical model. (Modified author abatract)

Descriptors: *Microwaves, *Radiation effects, Pathology, Histology, Lethal dosage, Rats, Laboratory animals, Dose rate, Respiratory system, Radiobiology, Mathematical models, Radiation dosage, Lung, Experimental data

Identifiers: *Microwave radiobiology, A

AD-774 823/9 NTIS Prices: PC A05/MF A01

On Mathematical Analysis of Gas Transport in the Lung

State Univ of New York Buffalo (256940)
AUTHOR: Chang, Hsin-Kang; Farhi, Leon E.
C2423G1 Fld: 6P GRAI7408
4 May 73 17p
Contract: N00014-68-A-0216
Project: NR-101-722
Monitor: 18
Availability: Pub. in Respiration Physiology, v18 p370-385 1973.

Abstract: The process of gas transport in the lung, involving two mechanisms, i.e., mass convection and molecular diffusion, may be analyzed mathematically. Several such analyses, taking the classical approach, the random walk approach and a nodal analysis, are reviewed. A detailed comparison, based on the physical model, the mathematical representation of the physical model, the method of solution, and the final results, is made for these analyses. The underlying assumptions of these analyses are also critically examined and suggestions for possible improvement are made. (Author)

Descriptors: *Lung, *Gas exchange(Biology), *Hypoxia*, Respiratory system, Humans, Mathematical models, Diffusion, Convection, Transport properties, Blood circulation, Oxygen, Carbon dioxide, Respiration, Physiology

Identifiers: N

AD-774 013/7 NTIS Price: Reprint

Vertical Distributions of Pulmonary Diffusing Capacity and Capillary Blood Flow in Man

School of Aerospace Medicine Brooks AFB Tex (317000)

Final rept.
AUTHOR: Michaelson, Edward D.; Sackner, Marvin A.; Johnson, Robert L. Jr
C0681E1 Fld: 6S, 57S GRAI7310
2 Aug 72 13p
Rept No: SAM-TR-72-339
Project: AF-7930
Task: 793003
Monitor: 18
Revision of report dated 20 Mar 72.
Availability: Pub. in Jnl. of Clinical Investigation, v52 n2 p359-369 Feb 73.

Abstract: In 6 normal upright subjects, a 100 ml bolus of 1/3 each neon, carbon monoxide, and acetylene (Ne, Co, and C2H2) was inspired from either residual volume (RV) or functional residual capacity (FRC) during a slow inspiration from RV to total lung capacity (TLC). After breath holding and subsequent collection of the exhalate, diffusing capacity and pulmonary capillary blood flow per liter of lung volume (DL/VA and Q dot sub c/VA) were calculated from the rates of CO and C2H2 disappearances relative to Ne. Means: DL/VA = 5.26 ml/min X mm Hg/liter (bolus at RV), 6.54 ml/min X mm Hg/liter (at FRC); Q dot sub c/VA 0.537 liters/min/liter (bolus at RV), 0.992 liters/min/liter (at FRC). Similar maneuvers using Xenon-133 confirmed, that during inspiration, more of the bolus goes to the upper zone if introduced at RV and more to the lower if at FRC. A lung model has been constructed which describes how DL/VA and Q dot sub c/VA must be distributed to satisfy the experimental data. According to this model, there is a steep gradient of Q dot sub c/VA increasing from apex to base similar to that previously determined by other techniques and also a gradient in the same direction, although not as steep, for DL/VA. This more uniform distribution of DL/VA compared to Q dot sub c/VA indicates a vertical unevenness of diffusing capacity with respect to blood flow (DL/Q dot sub c). (Author Modified Abstract)

Descriptors: (*Blood circulation, Gravity), (*Lungs, Blood circulation), Diffusion, Blood cells, Transport properties, Erythrocytes, Mathematical models, Physiology

Identifiers: Biodynamics, AF

AD-758 106 NTIS Price: Reprint

Dacrin: A Computer Program for Calculating Organ Dose from Acute or Chronic Radionuclide Inhalation

Battelle Pacific Northwest Labs., Richland, Wash. (9500022)
AUTHOR: Houston, J. R.; Strenge, D. L.; Watson, E. C.
A6881D2 Fld: 6R, 57V, 57E NSA3107
Dec 74 158p
Contract: AT(45-1)-1830
Monitor: 18

Abstract: For abstract, see NSA 31 07, number 16836.

Descriptors: (*Respiratory system, Radiation doses), (*Radioactive aerosols, *Inhalation), (*Radiation doses, *Computer calculations), (*Computer codes, *D codes), Acute irradiation, Biological models, Chronic irradiation, Dose rates, Internal irradiation, Lungs, Man, Mathematical models

Identifiers: NTISAEC

BNWL-B-389 NTIS Prices: PC E07/MF A01

Analog and Digital Simulation of the Radocardiogram

California Univ., Berkeley Lawrence Berkeley Lab. (1112800)
AUTHOR: Parker, H. G.; Van Dyke, D. C.; Upham, F. T.; Windsor, A. A.
A6665D1 Fld: 6E, 57E NSA3008
Jun 74 23p
Rept No: CONF-740708-57; SM-185/23
Contract: W-7405-eng-48
Monitor: 18

Abstract: For abstract, see NSA 30 08, number 21487.

Descriptors: (*Cardiovascular diseases, *Diagnosis), (*Heart, *Blood flow), (*Lungs, Blood flow), Analog systems, Biological models, Cardiography, Computer calculations, Data processing, Digital systems, Gamma cameras, Mathematical models, Nuclear medicine, Patients, Radionuclide administration, Scintiscanni-ng

Identifiers: NTISAEC

LBL-2491 NTIS Prices: PC E02/MF A01

Pulmonary Gas Transport and the Regulation of Ventilation at Rest and Exercise

Colorado Univ Denver Medical Center (088500)

Progress rept. no. 4 (Annual), 1 Jan-31 Dec 71
AUTHOR: Filley, Giles F.
A504312 Fld: 6E, 57O GRAI7219
Jun 72 40p
Contract: DA-49-193-MD-2227

Abstract: Patients with pulmonary disease and normal men have been studied experimentally to determine, respectively, the pulmonary abnormalities causing arterial hypoxemia and the mechanisms responsible for the hypoxic drive of man during exercise. Forty-seven cases of fibrotic lung disease were analyzed with the aid of a two-compartment lung model which dealt with O2 and CO2 exchange deficiencies due to wasted ventilation and shunted blood flow. Carbon monoxide data analysis is not yet finished. Hypoxic and hypercapneic drives were measured in 8 subjects at rest and at 3 levels of supine bicycle exercise. Both the respiratory mass spectrometer and the fuel cell O2 analyzer underwent substantial improvements during the year. (Author)

Descriptors: (*Lungs, Exercise), Hypoxia, Blood circulation, Correlation techniques, Malfunctions, Transport properties, Anatomical models, Oxygen, Carbon dioxide, Pathology, Ventilation, Spectrometers, Mathematical models

Identifiers: Wasted ventilation, Lung models

AD-746 979 NTIS Prices: PC A03/MF A01

Nonlinear Lumped Parameter Mathematical Model of Dynamic Response of the Human Body

Aerospace Medical Research Lab Wright-Patterson AFB Ohio (009850)
AUTHOR: Hopkins, Gordon R.
A4193E4 Fld: 6S, 57W GRAI7211
Dec 71 25p
Rept No: AMRL-TR-71-29-Paper-25
Project: AF-7231
Presented at the Symposium on Biodynamics Models and Their Applications held at Dayton, Ohio, on 26-28 Oct 70. Paper also included in AD-739 501, PC $11.00, MF $0.95.

Abstract: Two nonlinear models of man's dynamic response to low frequency vibration are discussed. The first model uses linear spring and damper elements but accounts for the nonlinear geometry of visceral mass motion. This model adequately reproduces both the input mechanical impedance and vibration transmission characteristics for a seated human subject. The second model includes the nonlinear effects of the lungs. The influence of this nonlinearity on the dynamic response is discussed and compared to experimental results from tests on animals. (Author)

Descriptors: (*Stress(Physiology), *Vibration), Mathematical models, Body, Humans, Responses, Physiology, Lungs, Experimental data, Animals

Identifiers: *Biodynamics

AD-740 462 NTIS Prices: PC A02/MF A01

Uneven Ventilation as a Continuous Distribution Function of Alveolar Dilution

School of Aerospace Medicine Brooks AFB Tex (317000)

Interim rept. Jun 68-Dec 69
AUTHOR: Manfredi, Philip D.; Rossing, Robert G.
A3004G1 Fld: 6P, 57S GRAI7122
Aug 71 32p
Rept No: SAM-TR-71-30
Project: AF-6319
Task: 631902

Abstract: Replicate nitrogen washout curves recorded in 10 normal subjects were analyzed both by the classical Fowler model and by a model which treats the alveolar dilution ratio as being a continuously distributed variable. The majority of the curves could be satisfactorily fitted by assuming the distribution function to be single and Normal (Gaussian); less frequently a bimodal function was required which was composed of two Normal distributions. Pulmonary clearance delay (PCD) values were derived from each model and also by a method of calculation directly from the raw data. The values obtained by all three methods agreed very well, and the three methods may be regarded as equivalent and interchangeable. By any of the three methods, all subjects except one showed on at least one occasion a PCD less than 10%, but frequently the second of the paired determinations was somewhat higher (up to 30%). One subject, although considered normal on the basis of routine clinical testing, showed values which ranged from 30%-100% delay. (Author)

Descriptors: (*Respiration, Mathematical models), Nitrogen, Lungs, Mathematical analysis

Identifiers: *Alveoli pulmonis, Nitrogen washout curve

AD-730 279 NTIS Prices: PC A03/MF A01

Flow and Mass Transfer in Capillary Blood Oxygenator Equipment

General Electric Co Philadelphia Pa Re-Entry and Environmental Systems Div (404884)

Rept. no. 1 (Final), 1 May 69-31 Jul 70
AUTHOR: Sherman, Martin P.; Kuchar, Norman R.
A1603K2 Fld: 6L, 58G GRAI7106
Sep 70 84p
Contract: DADA17-69-C-9138

Abstract: The flow of blood and the transport of blood gases in membrane capillary tubes is investigated analytically in order to provide a basis for the rational design of artificial gas transfer devices. Models for the transport phenomena in both intermediate-sized and erythrocyte-sized tubes are formulated. For intermediate-sized tubes, solutions for a number of cases, including well-mixed blood, homogeneous unmixed blood, and nonhomogeneous blood having a plasma layer adjacent to the wall, are presented. The axial lengths required for blood oxygenation are given as functions of the physical parameters. For erythrocyte-sized tubes, the plasma flow patterns in the 'bolus' region and 'lubrication layer' are computed, and the influence of these regions on gas transfer is described. (Author)

Descriptors: (*Blood circulation, *Oxygen equipment), (*Mechanical organs, *Lungs), Oxygen, Mass transfer, Capillaries, Design, Mathematical models

Identifiers: *Blood oxygenators, *Artificial lungs

AD-717 564 NTIS Prices: PC A05/MF A01

RESPIRATION SYSTEM HEAT EXCHANGE WITH EMPHASIS ON THE TRACHEAL REGION

Naval Air Development Center Johnsville Pa Aerospace Crew Equipment Dept (403012)

Interim rept.
AUTHOR: Gordon, Stephen L.
A0955K2 Fld: 6P, 57S USGRDR7022
1 Jul 70 89p
Rept No: NADC-AC-7008
Project: MR005.01.01A

Abstract: In order to measure details of respiratory heat exchange in the trachea of the dog, temperature probes with three sensors were positioned at four axial locations. The recorded inspiration temperatures, in conjunction with the assumed symmetrical nature of the flow, produced inspiratory temperature profiles for various respiration conditions and various gases. Based upon measurements obtained from three of the dogs, tracheal inspiration profiles show undeveloped entrance conditions and the developing nature of the flow along the axial direction. Tracheal wall probes indicate a cooler than body core temperature condition, which could effect the cooling of expired gases returning from the warmer lung region. Dry air and helium gas tests produced similar results. Saturated air tests indicated a lesser mid-stream to wall temperature differential, which is believed to be a result of coupling effects between the energy and mass transfer equations. (Author)

Descriptors: (*Respiratory system, Heat transfer), (*Trachea, Heat transfer), Body temperature, Respiration, Lungs, Gas flow , Gases, Measurement, Mathematical models, Mathematical analysis

AD-711 844 CFSTI Prices: HC A05/MF A01

A COMPARISON OF RATE VARIABLES FOR THE DESCRIPTION OF THE NITROGEN WASHOUT CURVE

School of Aerospace Medicine Brooks AFB Tex (317000)
AUTHOR: Rossing, Robert G.
A0891L2 Fld: 6P, 57S USGRDR7021
May 69 13p
Rept No: SAM-TR-70-233
Project: AF-6319
Task: 631902
Availability: Pub. in Mathematical Biosciences, v6 p283-293 1970.

Abstract: Eight different variables which have been used in the published literature to characterize the pulmonary washout process are compared. Each of these may be defined in terms of the volume and ventilation of the lung unit being studied, and therefore all are interchangeable and equivalent in information content. Expressions are given which also define each of them in terms of the other seven. These equations permit the conversion of results expressed in terms of one variable to equivalent values of any other. (Author)

Descriptors: (*Respiratory system, Nitrogen), (*Respiration, Mathematical models), Physiology, Ventilation, Lungs, Exponential functions

Identifiers: *Nitrogen washout

AD-711 480

THE PULMONARY RESPONSE TO HEMORRHAGIC SHOCK

Boston Univ Mass School of Medicine (061250)

Annual progress rept. 1 Aug 69-31 Jul 70
AUTHOR: Egdahl, Richard H.; Hechtman, Herbert B.
A0201J1 Fld: 6E, 6P, 923 USGRDR7012
31 Jul 70 30p
Contract: DADA17-68-C-8132

Abstract: Indicator dilution methodology has been applied to the study of pulmonary hemodynamics and ventilatory function before and after hemorrhagic shock and in in-vitro perfused lungs. New sampling techniques have been developed and new mathematical models applied to data analysis. Both vascular distention and the recruitment of new flow channels may play important roles in adaptive changes of the normal lung to varying cardiac outputs. After shock, pulmonary edema or prolonged in-vitro perfusion, pulmonary artery pressure rises and there is derecruitment. Other factors found to be of significance in the distribution of pulmonary flow and pulmonary function include posture, oxygen breathing and the pharmacologic agents norepinephrine, serotonin, endotoxin, dibenzyline and acetylcholine. A new method is described for the measurement of alveolar gas volumes and capillary blood volume. (Author)

Descriptors: (*Shock(Pathology), Hemorrhage), (*Respiratory system, Shock(Pathology)), Lungs, Physiology, Cardiovascular system, Blood pressure, Edema, Arteries, Oxygen consumption, Blood volume, Levarterenol, Serotonin, Toxins + antitoxins, Acetylcholine, Pharmacology, Mathematical models

AD-704 696 CFSTI Prices: HC A03/MF A01

THEORY OF SHEET FLOW IN LUNG ALVEOLI

California Univ San Diego La Jolla Dept of the Aerospace and Mechanical Engineering Sciences (072385)
AUTHOR: Fung, Y. C.; Sobin, S. S.
6353D1 Fld: 6P, 923 USGRDR6917
29 Aug 68 20p
Grant: AF-AFOSR-1186-67
Project: AF-9782
Task: 978201
Monitor: AFOSR-69-1671TR
Prepared in cooperation with University of Southern California, Los Angeles.
Availability: Pub. in Jnl. of Applied Physiology, v26 n4 p472-488 Apr 69.

Abstract: The capillary blood vessels in the pulmonary alveoli are so short and so closely knit that a new term -- 'sheet flow' -- is desirable to avoid the usual notion of a blood vessel as a tube. From the viewpoint of fluid mechanics the new terminology is particularly pertinent. In this article we consider the flow pattern of the blood in such a sheet. A theoretical approach as well as a large-scale model study was undertaken to determine the streamlines, the velocity distribution, and the pressure gradient in the pulmonary alveolar septa. The role of the elasticity of the system is considered. It is shown that in the range of linear elasticity, the fourth power of the thickness of the sheet satisfies the Laplace equation. The thickness distribution as a function of pulmonary arterial pressure, venous pressure, and alveolar air pressure is illustrated by several examples. (Author)

Descriptors: (*Lungs, *Blood circulation), Capillaries, Erythrocytes, Mathematical models, Models(Simulations), Fluid flow

AD-690 152

MATHEMATICAL MODELS FOR THE ANALYSIS OF THE NITROGEN WASHOUT CURVE

School of Aerospace Medicine Brooks AFB Tex (317000)

Technical rept. Jul 63-Jan 67
AUTHOR: Rossing, Robert G.; Danford, M. Bryan; Bell, Earl L.; Garcia, Raul
4464J3 Fld: 6P USGRDR6810
Nov 67 63p
Rept No: SAM-TR-67-100
Project: AF-6319
Task: 631902

Abstract: A general mathematical description of the washout of nitrogen from the lung during oxygen breathing is developed. From this, several specific mathematical models are derived and compared. These models each involve one of three different variables for description of the washout process: the alveolar dilution ratio, the specific tidal volume, or the rate constant. Two different types of models are considered: one involves a discrete distribution function of the basic variable; the other, a continuous distribution function. Several such models are applied to a series of washout curves as test problems. They are all found to be capable of fitting such curves with approximately equal precision. The choice between them must, therefore, be based on other factors such as theoretical suitability and ease of interpretation. On the basis of these criteria, the model suggested is one in which the alveolar dilution ratio manifests a Normal distribution, either unimodal or bimodal. Methods are developed for the calculation of certain indices from the parameters of this model. These indices may be of value in evaluating intersubject comparisons as well as intrasubject comparisons over time. Finally it is shown that these same indices may be calculated directly from the raw data, independent of any postulated distribution model. (Author)

Descriptors: (*Respiration, Mathematical models), Nitrogen, Lungs, Distribution functions, Oxygen

Identifiers: *Nitrogen washout

AD-666 651 CFSTI Prices: PC A04/MF A01

EVALUATION OF A COMPUTER SOLUTION OF EXPONENTIAL DECAY OR WASHOUT CURVES

School of Aerospace Medicine Brooks AFB Tex (317000)
AUTHOR: Rossing, Robert G.
393413 Fld: 6P USGRDR6723
Nov 66 8p
Rept No: SAM-TR-65-296
Project: AF-6319
Task: 631902
Monitor: 18
Availability: Published in Journal of Applied Physiology v21 n6 p1907-10 Nov 1966.

Abstract: A program has been developed for a digital computer which permits solution for the parameters, alpha sub i, omega sub i and A in the model: Y sub n/Y sub o = Summation over i of (alpha sub i omega sub i superscript n) + A, A = or > o. The program is in two sections. The first of these provides preliminary estimates of the parameters, the second refines the estimates so as to minimize the mean squared error ratio, defined as follows: MSR = Summation over i of the quantity ((y sub i - Y sub i (hat))/Y sub i (hat)) squared, degrees of freedom. Preliminary estimates from other sources may also be revised by the second portion of the program. Results are reported from the analysis, using this program, of 20 nitrogen washout curves obtained in dogs with and without induced lung disease. The parameter estimates were judged to be quite satisfactory and the MSR's were within the limits of the experimental error. (Author)

Descriptors: (*Physiology, Mathematical models), (*Exponential functions, Mathematical models), Lungs, Dogs, Bronchi, Biology, , Decay schemes, Digital computers, Computer programs, Nitrogen, Iterative methods, Convergence

Identifiers: Nitrogen washout

AD-659 501

*BIOPHYSICAL MECHANISMS AND SCALING PROCEDURES APPLICABLE IN ASSESSING RESPONSES OF THE THORAX ENERGIZED BY AIR-BLAST OVERPRESSURES OR BY NONPENETRATING MISSILES

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)
AUTHOR: Bowen, I. G.; Fletcher, E. R.; Richmond, D. R.; Hirsch, F. G.; White, C. S.
3493K4 Fld: 6U USGRDR6715
Nov 66 50p
Contract: DA-49-146-XZ-372
Monitor: DASA-1857

Abstract: A mathematical model was devised to study the dynamic response of the thorax of mammals to rapid changes in environmental pressure and to non-penetrating missiles impacting the rib cage near the mid-lateral point of the right or left thorax. Scaling procedures are presented for similar animals relating, for a given degree of damage, the body mass of the animal to various parameters describing the exposure 'dose'. Internal pressures computed with the model for a dog exposed at the end plate of a shock-tube are compared to those measured with a pressure transducer inserted in the esophagus down to the level of the heart. Computed time-displacement histories of missiles following impact with the right side of the thorax are compared to those obtained experimentally by means of high-speed motion picture photography. High internal pressures predicted with the model for non-penetrating impact are compared to those obtained experimentally and theoretically for exposure to air blast. Experimental data are presented arbitrarily assessing lung damage in animals struck by non-penetrating missiles (constant impact area) as a function of missile mass and impact velocity. These data are compared for several missile mass-velocity combinations with those computed using the mathematical model. Similarities in the dynamic responses of the thorax to air blast and to non-penetrating missiles are discussed. (Author)

Descriptors: (*Blast, Tolerances(Physiology)), (*Thorax, Blast), Mammals, Mathematical models, Wounds + injuries, Pressure, Shock waves, Lungs, Responses, Weapons

AD-652 893 CFSTI Prices: PC A03/MF A01

MATHEMATICAL ANALYSIS AND DIGITAL SIMULATION OF THE RESPIRATORY CONTROL SYSTEM

Rand Corp Santa Monica Calif (296600)
AUTHOR: Grodins, Fred S.; Buell, June; Bart, Alex J.
3283J1 Fld: 6D USGRDR6711
Mar 67 54p
Rept No: RM-5244-PR
Contract: F44620-67-C-0045
Monitor: 18

Abstract: The report expresses the basic material balance relationships for the lung-blood-tissue gas transport and exchange system in a set of differential-difference equations containing a number of dependent time delays. Additional equations define the chemical details of transport and acid-base buffering, concentration equilibria, and blood flow behavior. Finally, a control function is included defining the dependence of ventilation upon CSF (H(+)), and arterial (H(+)) and PO2 at the carotid chemoceptors. A Fortran program was written for convenient digital simulation of the responses of the system to a wide variety of forcings, including CO2 inhalation, hypoxia at sea level, altitude hypoxia, and metabolic disturbances in acid-base balance. Both dynamic and steady-state behavior of the model were reasonably realistic. (Author)

Descriptors: (*Bionics, Respiratory system), (*Respiratory system, Mathematical models), Lungs, Blood, Tissues(Biology), Gases, Transport properties, Difference equations, Differential equations, Acid-base equilibrium, Blood circulation, Control systems, Chemoreceptors, Computer programs, Digital computers, Responses, Carbon dioxide, Hypoxia, Metabolic diseases, Dynamics, Computer logic

AD-650 132 CFSTI Prices: PC A04/MF A01

SIMULATION OF A BIOLOGICAL SYSTEM ON AN ANALOG COMPUTER

Rand Corp Santa Monica Calif (000000)
AUTHOR: De Land, Edward C.
1705L1 USGRDR6509
1962 2p
Rept No: P-2307
Pub. in International Analogue Computation Meetings (3rd) Opatija, Sep 61, p375-84 1962.

Abstract: This paper demonstrates a method for simulating complex chemical equilibria and uses the respiratory function of the blood at the lung surface as an example. The analog computer is employed because its characteristic parallel computation and its fast solution-time enable the simulation of dynamic systems in real time. The results obtained for a small model indicate that the accuracy and stability are sufficient for analysis within the laboratory experimental error. The method is very flexible; basic models may be expanded to incorporate more complex phenomena. The digital computer gives results which are more accurate and reproducible but it has a slower solution time. This mathematical model of a biological system is the first in a series of simulations which will become successively more complex and, hence, more realistic representations of the biological system. (Author)

Descriptors: (*ANALOG COMPUTERS, BIONICS), (*BIONICS, ANALOG COMPUTERS), (*RESPIRATORY SYSTEM, MATHEMATICAL MODELS), SIMULATION, BLOOD, LUNGS, RESPIRATION, BLOOD PLASMA, ERYTHROCYTES, PARTIAL DIFFERENTIAL EQUATIONS, DIFFERENTIAL EQUATIONS, NUMERICAL ANALYSIS

AD-612 978

STUDY OF THE DYNAMICS OF THE LUNG-THORAX SYSTEM

Duke Univ Durham N C (000000)

Final rept.
AUTHOR: Hull, Wayland E. ; Long, E. Croft
1553E1 USGRDR
15 May 64 2p
Contract: Nonr1181 07
Task: 102 416

Abstract: The objectives s of the research were to study and define the factors which govern the motion of the thoraco-abdominal system and which contribute to the total opposition to ventilation of the lungs. A summary of the experimental program is presented. Topics include: (1) Early experiments; (2) Studies using analog computers; (3) Critical tracheal volume-flow in dogs and infants; (4) Atrial and esophageal pressure measurements in forced respiration; (5) Mechanical aspects of panting as a respiratory maneuver; (6) Respiratory dynamic resistance; (7) Evaluation of the equation of motion of the respiratory system; (8) Interpretation of respiratory pressure-volume Lissajous figures; (9) Changes of thoraco-abdominal resonant frequency with driving pressure; and (10) Status of research at time of this report.

Descriptors: (*RESPIRATORY SYSTEM, DYNAMICS), LUNGS, THORAX, TRACHEA, BRONCHI, RESPIRATION, GAS FLOW, LAMINAR FLOW, TURBULENCE, PRESSURE, INFANTS, DOGS, HEART, ESOPHAGUS, BODY TEMPERATURE, TISSUES (BIOLOGY), RESISTANCE (ELECTRICAL), MECHANICS, MATHEMATICAL MODELS, DIGITAL COMPUTERS

AD-606 521 CFSTI Price: PC A02

PHYSICOCHEMICAL CHARACTERISTICS OF PLACENTAL TRANSFER

Rand Corp Santa Monica Calif (000000)
AUTHOR: DeHaven, J. C. ; DeLand, E. C. ; Assali, N. S. ; Manson, W.
1544L3 USGRDR
Mar 62 2p
Rept No: P-2565
This paper was prepared for presentation at the Symposium on Biomedical Engineering to be held in San Diego, Calif., 19-21 Jun 62. Prepared in cooperation with California Univ., Los Angeles.

Abstract: A biophysicochemical model of certain maternal-fetal circulatory and metabolic relations was constructed for the purpose of a rigorous extra-uterine study of the transfer of respiratory gases and other elements across the placental membrane. The model was subsequently analyzed by a mathematical method for the minimization of a chemical free-energy function subject to constraints relating to mass, charge and phase transfer. As a preliminary investigation of the placental phenomenon, the model was applied to the representation of the exchanges of respiratory gases occurring between the venous and arterial sides of the total air-blood system. The model indicates a greater acidity for the fetal than for the maternal erythrocite intracellular medium. This feature, combined with other aspects of the results, could explain the lower oxygen saturation of fetal hemoglobin in utero, and also suggests that the fetal oxygen environment is not so inimical or stressful to the fetus as previously hypthesized. (Author)

Descriptors: (*PREGNANCY, BIOCHEMISTRY), (*EMBRYOS, RESPIRATORY SYSTEM), (*RESPIRATORY SYSTEM, MATHEMATICAL MODELS), REPRODUCTIVE SYSTEM, BLOOD CIRCULATION, MEMBRANES (BIOLOGY) , RESPIRATION, OXYGEN, CARBON DIOXIDE, HEMOGLOBIN, FEMALES, CHEMICAL REACTIONS, LUNGS, PH, BLOOD VESSELS

Identifiers: PLACENTA

AD-606 691 CFSTI Price: PC A02

ESTIMATED FUTURE EXTENTIONS OF TECHNOLOGY

General Dynamics/Convair, San Diego, Calif. (147 650)

Task IV rept.
0583E4 Fld: 6E, 5A USGRDR4120
3 Jan 66 64p
Rept No: GDC-DBD-66-001
Grant: PHS-PH43-65-1059
Monitor: 18
Rept. on Studies Basic to Consideration of Artificial Heart Research and Development Program.

Abstract: CONTENTS: Expected advances in the primary artifical heart hardware systems; Expected advances in solution of key biomedical problems; Expected advances in other main problem areas for implementation of a total artificial heart program; Expected advances in related and supportive technologies; Summary of expected advances/comparison of advances with and without a National Heart Institute Artificial Heart Program.

Descriptors: (*Heart, Mechanical organs), (*Mechanical organs, Heart), Power supplies, Pumps, Safety devices, Design, Blood coagulation, Toxicity, Cancer, Lungs, Edema, Acidosis, Infections, Cardiovascular diseases, Pathology, Surgical techniques, Surgical instruments, Implants, Medical personnel, Education, Mathematical models, Law, Sociology, Microminiaturization(Electronics), Medical research, Research program administration

PB-172 429 CFSTI Prices: PC A04/MF A01

Nomograms for Overpressure, Fireball Radius and Thermal Energy of Nuclear Weapons

General Electric Co Syracuse N Y Heavy Military Equipment Dept (408969)

Technical information series
AUTHOR: Cramer, W. Eugene
G0315D1 Fld: 18C, 77D GRAI8005
Aug 79 11p
Rept No: R79EMH10
Monitor: 18

Abstract: The effects of nuclear explosions have been known for more than three decades, and phenomena that emit the largest portions of energy are the overpressure (blast wave) and thermal radiation. Nomograms are presented that quickly provide first-cut estimates of the emitted peak-exposure levels. These levels are then related to: (1) the resulting damage effects of various structures and materials and (2) the biological effects on humans and animals. (Author)

Descriptors: *Nuclear explosions, *Radiation effects, Nomographs, Overpressure, Blast waves, Thermal radiation, Energy, Nuclear explosion damage, Materials, Structures, Radiation injuries, Humans, Animals

Identifiers: NTISDODXA

AD-A076 489/4 NTIS Prices: PC A02/MF A01

Relative Structural Considerations for Protection from Injury and Fatality at Various Overpressures

IIT Research Inst Chicago Ill (175350)

Final rept. 17 Jun 75-18 May 77
AUTHOR: Longinow, A.; Wiedermann, A.
F0663F1 Fld: 6U, 15F, 91I, 74H GRAI7808
Jun 77 133p
Rept No: IITRI-J6365
Contract DCPA01-75-C-0325
Monitor: 18

Abstract: This report contains the results of a study concerned with producing casualty (injury and fatality) relationships for people located in conventional buildings when subjected to the direct effects produced by nuclear weapons. People survivability estimates for people located in conventional basements of multistory buildings subjected to blast effects of megaton range nuclear weapons are presented. Results are for full basements with two-way reinforced concrete overhead floor systems supported on steel beams. The transient velocity field that may exist in such basements is modeled and used to determine the response of individuals located within. Two models having different levels of sophistication are used to simulate individuals. Results are used in part to gauge the adequacy of the simpler model. The more sophisticated model is subsequently used to examine two closely related problems. The first considers the influence of anthropometric variation of individuals on the general nature of the blast translation problem (in the tumbling mode) and the severity of the resulting impact with floor and walls. The second examines the tumbling characteristics of individuals in a series of representative flow environments.

Descriptors: *Nuclear warfare casualties, *Wounds and injuries, *Blast waves, *Overpressure, Survival(Personnel), Buildings, Structural response, Blast loads, Fallout shelters, Civil defense, Anthropometry, Mathematical analysis

Identifiers: NTISDODXA

AD-A049 040/9ST NTIS Prices: PC A07/MF A01

The Thoraco-Abdominal Systems's Response to Underwater Blast

Lovelace Foundation for Medical Education and Research
Albuquerque N Mex (212000)

Final technical rept. 1 Jun 74-30 Sep 76
AUTHOR: Fletcher, E. R.; Yelverton, J. T.; Richmond, D. R.
D1384A3 Fld: 6E, 6U, 57O GRAI7707
Sep 76 52p
Rept No: LF-55
Contract: N00014-75-C-1079
Monitor: 18

Abstract: The purpose of this study was to model the response of the thoraco-abdominal system to underwater-blast waves. The effort focused on the dynamics of submersed gas bubbles because previous studies had shown that most injuries occurred to the gas-containing organs and the immediately adjacent tissues. Experiments were conducted to obtain data for use as input in the development of a model. Gas-containing balloons, excised organs (swim bladders, gut sections and sheep lungs); excised organs (swim bladders and gut sections) in gelatin blocks; and whole animals (fish and rats) were viewed with high-speed cameras while being exposed to a shock wave in an underwater test chamber. Overpressure vs time was measured inside the thoraces and abdomens of sheep exposed at either of two depths to underwater blast in a test pond. Both the film and gauge records indicated that the gas bubbles enclosed in the various submersed objects underwent damped oscillations. In general, the measured frequencies and amplitudes of oscillation were shown to be consistent with the theory of spherical air bubbles undergoing adiabatic changes in free water.

Descriptors: *Wounds and injuries, *Underwater explosions, *Thorax, *Abdomen, Gastrointestinal system, Sheep, Overpressure, Models, Gas embolism, Ponds, Damping, Blast loads, Hyperbaric chambers, Oscillation, Shock waves, Blast waves

Identifiers: Pathology, NTISDODXA

AD-A034 356/6ST NTIS Prices: PC A04/MF A01

Probability of Injury from Airblast Displacement as a Function of Yield and Range

Lovelace Foundation for Medical Education and Research
Albuquerque N Mex (212000)

Topical rept.
AUTHOR: Fletcher, E. Royce; Yelverton, John T.; Hutton, Roy A.; Richmond, Donald R.
C6352J1 Fld: 15C, 15F, 57W GRAI7611
29 Oct 75 37p
Contract: DNA001-74-C-0120
Project: DNA-NWED-QAXM
Task: A012
Monitor: DNA-3779T

Abstract: The purpose of this study was to predict the probability of impact injuries due to whole-body translation by airblast as a function of yield and ground range. Predictions were made for personnel in different orientations in open terrain and near structural complexes. A mathematical model was used to calculate the time-displacement history of personnel from considerations of aerodynamic drag and ground friction. Predicted values of maximum velocity, displacement at maximum velocity, and total displacement were tabulated for 1224 exposure conditions. Biological criteria were presented which indicated that personnel subjected to decelerative tumbling over open terrain can tolerate much higher velocities than personnel impacting a nonyielding, flat surface at normal incidence. Methods for extending the presented results to other exposure conditions were discussed.

Descriptors: *Impact shock, *Airburst, *Nuclear warfare, *Tumbling, Wounds and injuries, Yield(Nuclear explosions), Range(Distance), Mathematical models, Casualties, Aerodynamic drag, Velocity, Blast waves, Displacement, Humans

Identifiers: NTISDODXA, NTISDODSD

AD-A022 785/OST NTIS Prices: PC A03/MF A01

THE RELATIONSHIP BETWEEN SELECTED BLAST-WAVE PARAMETERS AND THE RESPONSE OF MAMMALS EXPOSED TO AIR BLAST

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Technical progress rept.
AUTHOR: Richmond, Donald R.; Damon, Edward G.; Fletcher, E. Royce; Bowen, I. Gerald; White, Clayton S.
3503K2 Fld: 6U USGRDR6715
Nov 66 41p
Contract: DA-49-146-XZ-372
Project: 03.012
Monitor: DASA-1860

Abstract: Shock tubes and high explosives were used to produce blast waves of various pressure-time patterns in order to study their biological effects. Data obtained from these experiments showed that, against a reflecting surface, the LD50 reflected pressure for any given species remained fairly constant at the 'longer' durations and then rose sharply at the 'shorter' times. For dogs and goats, 'long' durations were beyond 20 msec and for mice, rats, guinea pigs, and rabbits, beyond 1 to 3 msec. At the 'shorter' durations, response depended to a great extent on the impulse, and on peak pressure for the 'longer' pulses. Higher reflected pressures can be withstood if animals are located beyond a certain distance from the reflecting surface where they receive the incident and reflected pressures in two steps, separated by a given time-interval. In freestream exposures to air blast, orientation was significant. Animals suspended vertically or prone-side-on showed a lower tolerance to blast waves of a given intensity or at a given range than those end-on because the dynamic pressure appeared to add to their side-on pressure dose. Except for eardrum rupture and sinus hemorrhage, animals exhibited a remarkable tolerance to 'slow'-rising blast pressures without the presence of shock fronts. The lungs are considered the critical target organs in blast effects studies. (Author)

Descriptors: (*Blast, Tolerances(Physiology)), Mammals, Responses, Pressure, Time, Shock waves, Shock tubes, Wounds + injuries, Lungs, Ear, Mortality rates, Thresholds(Physiology), Hemorrhage, Pathology

AD 653 131 CFSTI Prices: PC A03/MF A01

74088096
EFFECTS OF BLAST WAVES ON BIOLOGICAL STRUCTURES
OESTREICHER H L
J ACOUST SOC AM 55. (SUPPL). 1974 S26 Coden: JASMA
Descriptors: ABSTRACT HUMAN ANIMAL BODY ELASTIC FLUID MECHANICAL SYSTEM
Concept Codes: BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-GENERAL BIOPHYS TECH(10504), EXTERN EFF-SONICS,ULTRASONICS(+10608), PHYSIOLOGY-STRESS(12008), PATHOLOGY-GENERAL STUDIES(+12502)
Biosystematic Codes: ANIMALIA-UNSPECIFIED(33000), HOMINIDAE-(86215)

55003352
OCULAR CHANGES FOLLOWING AIR BLAST INJURY
KING Y Y
ARCH OPHTHALMOL 86 (2). 1971 125-126. Coden: AROPA
Descriptors: CHILD OPTIC NERVE ATROPHY
Concept Codes: EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612), CHORDATE BODY REGNS-NECK(11308), CARDIOVASC SYST-GENL STUDS,METHS(14501), SENSE ORGANS-PATHOLOGY(+20006), NERVOUS SYST-PATHOLOGY(+20506)

73026337
THE EFFECTS OF HYPERBARIC OXYGEN TREATMENT FOR BLAST INJURY IN THE BEAGLE
DAMON E G; JONES R K
PHYSIOLOGIST 15 (3). 1972 113 Coden: PYSOA
Descriptors: ABSTRACT
Concept Codes: AEROSP/UNDRWATR BIOL-PHYSIOL,MED(06006), BIOCHEM-GASES(+10012), EXTERN EFF-PRESSURE(+10606), EXTERN EFF-PHYSICAL,MECH EFFECTS(10612), BLOOD/BODY FLDS-BLD,LYM,RES PATH(+15006)
Biosystematic Codes: CANIDAE(85765)

73018244
PHYTO TOXIC METABOLITES OF PENTA CHLOROBENZYL ALCOHOL
ISHIDA M
MATSUMURA, FUMIO, G. MALLORY BOUSH AND TOMOMASA MISATO (ED.). ENVIRONMENTAL TOXICOLOGY OF PESTICIDES. PROCEEDINGS OF A UNITED STATES-JAPAN SEMINAR. OISO, JAPAN, OCTOBER, 1971. XIV+637P. ILLUS. MAPS. ACADEMIC PRESS: NEW YORK, N.Y., U.S.A.; LONDON, ENGLAND. 1972 281-306 Coden: 02716
Descriptors: TOMATO RICE COMPOST RICE BLAST FUNGICIDE LEAF INJURY
Concept Codes: BIOCHEM STUD GENERAL(10060), METABOLISM-GENL STUD,METAB PATHW(+13002), PLANT PHYSIOL-METABOLISM(+51519), AGRONOMY-GRAIN CROPS(52504), SOIL SCI-GENL STUDS,METHS(+52801), HORTICULT-VEGETABLES(53008), PHYTOPATHOL-DIS BY FUNGI(54502), PHYTOPATHOL-NONPARASITIC DISEASE(+54512), PEST CONTRL GENL/PESTICS/HERBICS(+54600)
Biosystematic Codes: PLANTAE-UNSPECIFIED(11000), GRAMINEAE(-25305), SOLANACEAE(26775), ABSTRACTS OF MYCOLOGY(95000)

72062302
RECOVERY OF THE RESPIRATORY SYSTEM FOLLOWING BLAST INJURY
DAMON E G; YELVERTON J T; LUFT U C; JONES R K
GOV REP ANNOUNCE 71 (7). 1971 61 AD-718 369 Coden: GVRAA
Descriptors: SHEEP
Concept Codes: BIOCHEM-GASES(10012), EXTERN EFF-PRESSURE(+1-0606), PHYSIOLOGY-STRESS(+12008), RESPIRATORY SYST-PATHOLOGY(-+16006)
Biosystematic Codes: BOVIDAE(85715)

52099892
ARTERIAL GAS EMBOLI AFTER BLAST INJURY
VAN MASON H H; DAMON E G; DICKINSON A R; NEVISON T O JR
PROC SOC EXP BIOL MED 136 (4). 1971 1253-1255. Coden: PSEBA
Descriptors: DOG SUBLETHAL LUNG CONTUSION
Concept Codes: BIOCHEM-GASES(+10012), BIOPHYS-GENERAL BIOPHYS TECH(10504), EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612), ANATOMY/HISTOL-EXPERIMENTAL(11104), PATHOLOGY-THERAPY(12512), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST BLD VESS PATHOL(+14508), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: CANIDAE(85765)

52099179
UNDER WATER BLAST INJURY A REVIEW OF THE LITERATURE
WOLF N M
U S NAV SUBMAR MED CENTER REP (646). 1970 1-13. Coden: XNSRB
Descriptors: MAN ANIMALS
Concept Codes: AEROSP/UNDRWATR BIOL-PHYSIOL,MED(+06006), BIOPHYS-GENERAL STUDIES(+10502), EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700), HOMINIDAE(86215)

71003705
COMPARATIVE EFFECTS OF HYPEROXIA AND HYPERBARIC PRESSURE IN TREATMENT OF PRIMARY BLAST INJURY
DAMON E G; JONES R K
PHYSIOLOGIST 13 (3). 1970 175 Coden: PYSOA
Descriptors: ABSTRACT GUINEA PIG RABBIT AIR EMBOLISM CARDIO PULMONARY PATHOLOGY
Concept Codes: BIOCHEM-GASES(+10012), EXTERN EFF PRESSURE(+-10606), EXTERN EFF-PHYSICAL,MECH EFFECTS(10612), PATHOLOGY-THERAPY(+12512), CARDIOVASC SYST-HEART PATHOLOGY(14506), CARDIOVASC SYST-BLD VESS PATHOL(14508), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: LEPORIDAE(86040), CAVIIDAE(86300)

51070743
BLAST INJURIES OF THE CHEST AND ABDOMEN
HULLER T; BAZINI Y
ARCH SURG 100 (1). 1970 24-30. Coden: ARSUA
Descriptors: MAN
Concept Codes: PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), AEROSP/UNDRWATR BIOL-PHYSIOL,MED(+06006), RADIATION BIOL-RADT-N,ISOTOP TECH(06504), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL BIOPHYS TECH(10504), EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612), ANATOMY/HISTOL-SURGERY(+11105), ANATOMY/HIST-OL-RADIOLOGIC(11106), CHORDATE BODY REGNS-THORAX(11312), CHORDATE BODY REGNS-ABDOMEN(+11314), PATHOLOGY-GENERAL STUDIES(+12502), PATHOLOGY-DIAGNOSTIC(+12504), METABOLISM-GENL STUD,METAB PATHW(13002), DIGESTIVE SYST-GENL STUDS,METHS(1400-1), DIGESTIVE SYST-PATHOLOGY(+14006), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST-HEART PATHOLOGY(+14506), CARDIOVASC SYST-BLD VESS PATHOL(14508), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), BLOOD/BODY FLDS-BLD,LYM,RES PATH(15006), BLOOD/BODY FLDS-LYMPHAT TISS,RES(15008), RESPIRATORY SYST-PATHOLOGY(+16006), MUSCLE SYST-PATHOLOGY(175-06), NERVOUS SYST-GENL STUDS,METHS(20501), NERVOUS SYST-PHYSIOL,BIOCHEM(20504), PHARMACOL-NEUROPHARMACOLOGY(22024), ROUTES OF IMMUNIZ,INFECT,-THERAP(22100)
Biosystematic Codes: HOMINIDAE(86215)

51047545
BLAST INJURY OF THE CHEST
HIRSCH M; BAZINI J
CLIN RADIOL 20 (4). 1969 362-370. Coden: CLRAA
Descriptors: MAN RADIOLOGIC DIAGNOSIS ABDOMINAL INJURIES PULMONARY HEMORRHAGE LACERATION
Concept Codes: PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), AEROSP/UNDRWATR BIOL-STUDS,METHS(06002), RADIATION BIOL-RADTN-,ISOTOP TECH(+06504), BIOCHEM-GASES(10012), EXTERN EFF-PHYSICAL,MECH EFFECTS(10612), ANATOMY/HISTOL-RADIOLOGIC(1-1106), CHORDATE BODY REGNS-THORAX(+11312), CHORDATE BODY REGNS-ABDOMEN(+11314), PATHOLOGY-GENERAL STUDIES(+12502), PATHOLOGY-DIAGNOSTIC(+12504), CARDIOVASC SYST-HEART PATHOLOGY-(14506), CARDIOVASC SYST-BLD VESS PATHOL(+14508), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-PATHOLOGY(+160-06), NERVOUS SYST-PHYSIOL,BIOCHEM(20504)
Biosystematic Codes: HOMINIDAE(86215)

70048120
A STUDY OF EFFECTS OF COMBINED BLAST AND RADIATION INJURY IN SHEEP
JONES R K; CHIFFELLE T L; RICHMOND D R
SCHILDT, BO AND LARS THOREN (EDITED BY). INTERMEDES PROCEEDINGS. COMBINED INJURIES AND SHOCK. XIV + 311P. ILLUS. ALMQVIST & WIKSELL:, STOCKHOLM, SWEDEN. 1968 57-66 Coden: 00216
Descriptors: GRANULOCYTOPENIA PULMONARY INJURY
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), RADIATION BIOL-RADTN EFF,PROTECT(+06506), EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612), PATHOLOGY-GENERAL STUDIES(+12502), BLOOD/BODY FLDS-BLOOD CELL STUDS(+15004), BLOOD/BODY FLDS-BLD,LYM,RES PATH(+15006), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: BOVIDAE(85715)

50120147
OCULAR BLAST INJURIES HUMAN/
QUERE M A; BOUCHAT J; CORNAND G
AMER J OPHTHALMOL 67 (1). 1969 64-69. Coden: AJOPA
Concept Codes: ANATOMY/HISTOL-SURGERY(11105), SENSE ORGANS-PATHOLOGY(+20006)
Biosystematic Codes: HOMINIDAE(86215)

50021021
MECHANISM OF ACTION OF A POWERFUL BLAST WAVE ON THE ORGANISM DOG RABBIT/
ALEKSANDROV L N; DYSKIN E A
VESTN KHIR IM I I GREKOVA 99 (11). 89-94. 1967. Coden: VKHGA
Concept Codes: RADIATION BIOL-RADTN EFF,PROTECT(06506), EXTERN EFF-PRESSURE(10606), PATHOLOGY-GENERAL STUDIES(12502), RESPIRATORY SYST-PATHOLOGY(16006), MUSCLE SYST-PATHOLOGY(1750-6), BONE,JNTS,FASC,CONN/ADIP-PATHOL(18006), INTEGUMENT SYST-PATHOLOGY(18506), ENVIRON HEALTH-RADIATION HEALTH(+37017)
Biosystematic Codes: CANIDAE(85765), LEPORIDAE(86040)

69061322
BLAST INJURIES OF THE HAND
NOSKIN E A
INT SURG 50 (3). 1968 213 Coden: INTSA
Descriptors: ABSTRACT BDY SURGICAL METHOD
Concept Codes: ANATOMY/HISTOL-SURGERY(11105), PATHOLOGY GENERAL STUDIES(+12502), PEDIATRICS(25000)
Biosystematic Codes: HOMINIDAE(86215)

55058081
SIMULTANEOUS DIFFUSION AND CONVECTION IN SINGLE BREATH LUNG WASHOUT
SCHERER P W; SHENDALMAN L H; GREENE N M
BULL MATH BIOPHYS 34 (3). 1972 393-412. Coden: BMBIA
Descriptors: HUMAN MATHEMATICAL MODELS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-ANATOMY(+16002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+-16004), DENTAL/ORAL BIOL-PHYSIOL,BIOCHEM(19004)
Biosystematic Codes: HOMINIDAE(86215)

55000330
FLOW LIMITATION IN A COLLAPSIBLE TUBE
LAMBERT R K; WILSON T A
J APPL PHYSIOL 33 (1). 1972 150-153. Coden: JAPYA
Descriptors: LUNG MECHANICS STRESS ANALYSIS MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-BIOENGINEERING(+10511), BIOPHYS-BIOCYBERNETICS(+10515), EXTERN EFF-PHYSICAL,MECH EFFECTS(10612), MOVEMENT(+12100), RESPIRATORY SYST-GENL STUD,METHS(+16001)

73020741
A MATHEMATICAL MODEL OF OXYGEN SATURATION AND DE SATURATION OF THE BODY UNDER INCREASED PRESSURE IN A RIGHT TO LEFT BLOOD SHUNT
BERGELSON M N; BOKERIYA L A
EKSP KHIR ANESTEZIOL 17 (3). 1972 59-64 Coden: EKHAA
Descriptors: LUNGS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(+10515), CARDIOVASC SYST-PHYSIOL,BIOCHEM(+14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

73000303
PROBLEMS ASSOCIATED WITH SETTING SAFE LEVELS FOR WORKING WITH PLUTONIUM
DOLPHIN G W
HEALTH PHYS 22 (6). 1972 937-942 Coden: HLTPA
Descriptors: HUMAN MATHEMATICAL MODEL LUNG CLEARANCE BLOOD BODY ORGANS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), RADIATION BIOL-RADTN EFF,PROTECT(+06506), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(+10515), PHYSIOLOGY-GENERAL STUDIES(+1-2002), MINERALS(+13010), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(+15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), ENVIRON HEALTH-OCCUPATNL HEALTH(+37013), ENVIRON HEALTH-RADIATION HEALTH(+37017)
Biosystematic Codes: HOMINIDAE(86215)

53055643
MATHEMATICAL MODELS IN PHYSIOLOGY AND MEDICINE
ADAM W E; PAIVA M
BIOMED TECH 16 (1). 1971 32-39. Coden: BMZTA
Descriptors: REVIEW RADIOACTIVE SUBSTANCES LUNG GAS EXCHANGE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), RADIATION BIOL-GENERAL STUDIES(+06502), BIOCHEM-GASES(10012), RESPIRATORY SYST-GENL STUD,METHS(+16001)
Biosystematic Codes: HOMINIDAE(86215)

53011019
PULMONARY GAS TRANSPORT CHARACTERIZATION BY A DYNAMIC MODEL
SAIDEL G M; MILITANO T C; CHESTER E H
RESPIR PHYSIOL 12 (3). 1971 305-328. Coden: RSPYA
Descriptors: HUMAN MATHEMATICAL MODEL CHRONIC OBSTRUCTIVE LUNG DISEASE
Concept Codes: BIOCHEM-GASES(10012), BIOPHYS MEMBRANE PHENOMENA(+10508), BIOPHYS-BIOENGINEERING(+10511), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: HOMINIDAE(86215)

72037150
A DYNAMIC MODEL OF LUNG MECHANICS
NIGHTINGALE J M
PHYS MED BIOL 16 (1). 1971 155 Coden: PHMBA
Descriptors: ABSTRACT HUMAN RESPIRATORY DISORDERS MATHEMATICAL MODEL VENTILATOR
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: HOMINIDAE(86215)

72032677
MATHEMATICAL MODEL FOR THE OXYGENATION AND THE ELIMINATION OF CARBON DI OXIDE IN AN ARTIFICIAL LUNG CONSISTING OF CAPILLARY TUBES
LEGAULT R; AWAD J A; VERRETTE J L; BARIL M
PHYS MED BIOL 16 (4). 1971 710 Coden: PHMBA
Descriptors: ABSTRACT
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(•10012), BIOPHYS-BIOCYBERNETICS(•10515), CARDIO-VASC SYST-PHYSIOL,BIOCHEM(•14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)

51099421
MATHEMATICAL MODELS FOR ANALYSIS OF BACTERIAL ENDO CARDITIS DATA
EISENBERG H B; GEOGHAGEN R R M; WALSH J E
BIOM Z 10 (4). 1968 248-256. Coden: BIZEB
Descriptors: HUMAN PENICILLIN STREPTOMYCIN ANTI INFECT-DRUG POISSON DISTRIBUTION ALCOHOLISM LUNG DISEASE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), BIOCHEM STUD-GENERAL(10060), CARDIOVASC SYST-HEART PATHOLOGY(•14506), RESPIRATORY SYST-PATHOLOGY(16006), PSYCHIATRY-ADDICTION(INC SMOKNG)(21004), MED/CLIN MICROBIOL-BACTERIOLOGY(•36002), PUB HEALTH-ADMINISTR,STATISTICS(•37010), CHEMOTHERAPY-ANTIBACTERIAL AGNTS(•38504)
Biosystematic Codes: BACTERIA-UNSPECIFIED(06000), HOMINIDAE-(86215)

51076034
MODELING OF LUNG GAS EXCHANGE MATHEMATICAL MODELS OF THE LUNG THE BOHR MODEL STATIC AND DYNAMIC APPROACHES/
MURPHY T W
MATH BIOSCI 5 (3-4). 1969 427-447. Coden: MABIA
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), BIOCHEM-GASES(10012), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: ANIMALIA-UNSPECIFIED(33000)

51066062
COMPARISON OF MATHEMATICAL MODELS FOR CAT LUNG AND VISCO ELASTIC BALLOON DERIVED BY LAPLACE TRANSFORM METHODS FROM PRESSURE VOLUME DATA
HILDEBRANDT J
BULL MATH BIOPHYS 31 (4). 1969 651-667. Coden: BMBIA
Descriptors: PLETHYSMOGRAPH
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), BIOPHYS GENERAL STUDIES(•10502), BIOPHYS-GENERAL BIOPHYS TECH(10504), PHYSIOLOGY-GENERAL STUDIES(•12002), RESPIRATORY SYST GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: FELIDAE(85770)

50095934
SIMULTANEOUS PAIRWISE LINEAR STRUCTURAL RELATIONSHIPS MATHEMATICAL MODEL HUMAN LUNG CAPACITY INSTRUMENT/
BARNETT V D
BIOMETRICS 25 (1). 129-142. 1969. Coden: BIOMA
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), PHYSIOLOGY-INSTRUMENTATION(12004), RESPIRATORY SYST-GENL STUD,METHS(16001), PUB HEALTH-GENL,MISCELL(37001)
Biosystematic Codes: HOMINIDAE(86215)

50035351
PULMONARY GAS TRANSPORT A MATHEMATICAL MODEL OF THE LUNG MAN/
FILLEY G F; BIGELOW D B; OLSON D E; LACQUET L M
AMER REV RESP DIS 98 (3). 480-489. 1968. Coden: ARRDA
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-GENERAL(10060), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), RESPIRATORY SYST-PATHOLOGY(16006)
Biosystematic Codes: HOMINIDAE(86215)

69065451
MATHEMATICAL MODEL AND INST ELECTRIC ANALOG OF THE PASSIVE EXHALATION OF A DOGS LUNG
GOLDMAN E; SADOSKY O; GOLDMAN L J
MEDICINA (BUENOS AIRES) 28 (6). 1968 327 Coden: MEDCA
Descriptors: ABSTRACT
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS BIOENGINEERING(10511), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: CANIDAE(85765)

70026797
FLUID DYNAMIC FLAPPING OF A COLLAPSIBLE CHANNEL SOUND GENERATION AND FLOW LIMITATION
GROTBERG J B; DAVIS S H
UNIV. CHIC. PRIZKER SCH. MED., CHICAGO, ILL. 60637, USA.
J BIOMECH 13 (3). 1980. 219-230. Coden: JBMCB
Language: ENGLISH
Descriptors: HUMAN FLATTENED AIRWAY MATHEMATICAL MODEL PATHOLOGY PHYSIOLOGY LUNG WHEEZING
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: HOMINIDAE(86215)

69081887
VISCOSITY AND DENSITY DEPENDENCE DURING MAXIMAL FLOW IN MAN
STAATS B A; WILSON T A; LAI-FOOK S J; RODARTE J R; HYATT R E
DIV. THORAC. DIS. INTERN. MED., MAYO CLIN., ROCHESTER, MINN. 55901, USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 48 (2). 1980. 313-319. Coden: JARPD
Language: ENGLISH
Descriptors: LUNG MATHEMATICAL MODEL PERIPHERAL RESISTANCE FLOW RESISTANCE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(+10012), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), METABOLISM-ENERGY,RESPIRATION(13003), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: HOMINIDAE(86215)

69075037
EFFECT OF LUNG SURFACTANT SUBSTANCES ON OXYGEN MASS TRANSFER
BEREZOVSKII V A; GORCHAKOV V YU; PETUNIN YU I; YAKUT L I
A.A. BOGOMOLETS INST. PHYSIOL., ACAD. SCI. UKR. SSR, KIEV, USSR.
FIZIOL ZH (KIEV) 25 (4). 1979. 371-378. Coden: FIZHD
Language: RUSSIAN
Descriptors: RAT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(+10012), BIOCHEM STUD-LIPIDS(+10066), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-MEMBRANE PHENOMENA(+10508), BIOPHYS-BIOCYBERNETICS(+10515), BLOOD/BODY FLDS-OTHER BODY FLDS(+15010), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: MURIDAE(86375)

69069846
A COMPARISON OF VOLUME CONDUCTOR AND SOURCE GEOMETRY EFFECTS ON BODY SURFACE AND EPI CARDIAL POTENTIALS
RUDY Y; PLONSEY R
DEP. BIOMED. ENG., CASE WEST. RESERVE UNIV., CLEVELAND, OHIO 44106, USA.
CIRC RES 46 (2). 1980. 283-291. Coden: CIRUA
Language: ENGLISH
Descriptors: ANIMAL BLOOD CAVITY PERI CARDIUM MUSCLE FAT LUNG REGION HYPERTROPHY DILATION MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-GROSS(11102), PATHOLOGY-DIAGNOSTIC(12504), CARDIOVASC SYST-GENL STUDS,METHS(+14501), CARDIOVASC SYST-ANATOMY(+14502), CARDIOVASC SYST-PHYSIOL,BIOCHEM(+14504), CARDIOVASC SYST-HEART PATHOLOGY(14506), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-ANATOMY(+16002), MUSCLE SYST-ANATOMY(+17502), BONE,JNTS,FASC,CONN/ADIP ANATOMY(+18002), COELOM MEMBRANES,MESENTERIES,ETC(18200), INTEGUMENT SYST-ANATOMY(18502)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

69055961
COMMENTS ON THE EFFECT OF VARIATIONS IN THE SIZE OF THE HEART ON THE MAGNITUDE OF ELECTRO CARDIOGRAM POTENTIALS
RUDY Y; PLONSEY R
DEP. BIOMED. ENG., CASE WEST. RESERVE UNIV., CLEVELAND, OHIO 44106, USA.
J ELECTROCARDIOL (SAN DIEGO) 13 (1). 1980. 79-82. Coden: JECAB
Language: ENGLISH
Descriptors: CARDIOMEGALY CONGESTIVE HEART FAILURE EDEMA LUNG CONDUCTIVITY MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(+10515), PATHOLOGY-DIAGNOSTIC(12504), PATHOLOGY-INFLAMMATN,INFLAM DIS(12508), CARDIOVASC SYST-GENL STUDS,METHS(+14501), CARDIOVASC SYST-ANATOMY(+14502), CARDIOVASC SYST-PHYSIOL,BIOCHEM(+14504), CARDIOVASC SYST-HEART PATHOLOGY(+14506), BLOOD/BODY FLDS-OTHER BODY FLDS(+15010), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

69052007
MAXIMUM LIKELIHOOD ESTIMATION OF A STOCHASTIC COMPARTMENT MODEL OF CANCER LATENCY LUNG CANCER MORTALITY AMONG WHITE FEMALES IN THE USA
MANTON K G; STALLARD E
CENT. DEMOGR. STUD., DUKE UNIV., DURHAM, N.C., USA.
COMPUT BIOMED RES 12 (4). 1979 (RECD. 1980). 313-326
Coden: CBMRB
Language: ENGLISH
Descriptors: MATHEMATICAL MODEL CARCINOGENESIS AGE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-NECROSIS(12510), RESPIRATORY SYST-PATHOLOGY(*16006), NEOPLSMS/NEOPL AGNTS-PATH-CLINIC(*24004), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(*24007), GERONTOLOGY(*24500), PUB HEALTH-ADMINISTR,STATISTICS(*37010), EPIDEMIOL-ORGANIC DIS,NEOPLASMS(*37054)
Biosystematic Codes: HOMINIDAE(86215)

69051957
UPTAKE DISTRIBUTION AND METABOLISM OF CARBON-14 LABELED AMARANTH IN THE FEMALE RAT
RUDDICK J A; CRAIG J; STAVRIC B; WILLES R F; COLLINS B
ENVIRON HEALTH CENT., ENVIRON CONTAM., TUNNEYS PASTURE, OTTAWA, ONT. K1A 0L2, CAN.
FOOD COSMET TOXICOL 17 (5). 1979. 435-442. Coden: FCTXA
Language: ENGLISH
Descriptors: STOMACH INTESTINE BLOOD BILE HEART KIDNEY LIVER LUNG CARCINOGEN THIN LAYER CHROMATOGRAPHY MATHEMATICAL MODEL RESPIRATORY GAS NAPHTHIONIC-ACID URINE FECES
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADIN,ISOTOP TECH(06504), CLIN BIOCHEM-GENL STUDIES(10006), BIOCHEM-GASES(10012), BIOCHEM METH-GENERAL(10-050), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(10515), PHYSIOLOGY-COMPAR-ATIVE(12003), MOVEMENT(12100), METABOLISM-GENL STUD,METAB PATHW(*13002), METABOLISM-ENERGY,RESPIRATION(13003), FOOD TECH-PREP,PROCESSNG,STORAGE(13532), DIGESTIVE SYST-GENL STUDS,METHS(14001), DIGESTIVE SYST-PHYSIOL,BIOCHEM(*14004), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(*15002), BLOOD/BODY FLDS-OTHER BODY FLDS(15010), URIN SYST/EXT SECR-PHYSL,BIOCHEM(*15504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), ROUTES OF IMMUNIZ,INFECT,THERAP(-22100), TOXICOL-GENL/EXP STUDS,METHS(*22501), TOXICOL-FOOD,RESIDS,ADDIT,PRESRV(*22502), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(*-24007)
Biosystematic Codes: MURIDAE(86375)

69040603
EFFECTS OF COMMON DEAD SPACE ON INERT GAS EXCHANGE IN MATHEMATICAL MODELS OF THE LUNG
FORTUNE J B; WAGNER P D
DEP. MED., UNIV. CALIF. SAN DIEGO, LA JOLLA, CALIF. 92093, USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 47 (4). 1979. 896-906 Coden: JARPD
Language: ENGLISH
Descriptors: VENTILATION PERFUSION
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), METABOLISM ENERGY,RESPIRATION(*13003), CARDIOVASC SYST-GENL STUDS,METHS(*14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

69026750
IMPROVED MEASUREMENTS OF SHEAR MODULUS AND PLEURAL MEMBRANE TENSION OF THE LUNG
HAJJI M A; WILSON T A; LAI-FOOK S J
DEP. AEROSPACE ENG. MECH., UNIV. MINN., MINNEAPOLIS, MINN. 55455, USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 47 (1). 1979. 175-181. Coden: JARPD
Language: ENGLISH
Descriptors: DOG PIG HORSE DEFLATION WORK MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL STUDIES(*10502), BIOPHYS-MEMBRANE PHENOMENA(*-10508), BIOPHYS-BIOCYBERNETICS(*10515), CHORDATE BODY REGNS-THORAX(11312), PHYSIOLOGY-COMPARATIVE(12003), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), COELOM MEMBRANES,MESENTERIES,ETC(*18200)
Biosystematic Codes: SUIDAE(85740), CANIDAE(85765), EQUIDAE(86145)

69021560
FLOW AND POWER OUTPUT OF RIGHT VENTRICLE FACING LOAD WITH VARIABLE INPUT IMPEDANCE
PIENE H; SUND T
INST. MED. BIOL., UNIV. TROMSO, N-9000 TROMSO, NORW.
AM J PHYSIOL 237 (2). 1979. H125-H130. Coden: AJPHA
Language: ENGLISH
Descriptors: CAT MATHEMATICAL MODEL LUNG RESISTANCE COMPLIANCE
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD GENERAL(10060), BIOPHYS-GENERAL STUDIES(*10502), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD,BODY FLDS BLOOD CELL STUDS(15004), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: BOVIDAE(85715)

69020098
DISTRIBUTION OF REGIONAL VOLUMES AND VENTILATION IN EXCISED CANINE LOBES
KALLOK M J; WILSON T A; RODARTE J R; LAI-FOOK S J; HARRIS L D; CHEVALIER P A
C/O SECT. PUBL., MAYO CLIN. 200 FIRST ST. SW. ROCHESTER, MINN. 55901. USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 47 (1). 1979. 182-191. Coden: JARPD
Language: ENGLISH
Descriptors: LUNG MATHEMATICAL MODEL GRAVITATIONAL DEFORMATION CONTINUUM MECHANICS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-GENERAL STUDIES(•10502), BIOPHYS-BIOCYBERNETICS(•10515), EXTERN EFF-ELECTR,MAGNET,GRAVITY(•10610), ANATOMY/HISTOL-EXPERIMENTAL(11104), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: CANIDAE(85765)

19012957
PROSTAGLANDIN E-1 UPTAKE BY ISOLATED LUNGS PERFUSED WITH PHYSIOLOGIC SALT SOLUTION
LINEHAN J H; DAWSON C A; WAGNER-WEBER V
RES. SERV./151A, VETERANS ADM. MED. CENT., WOOD, WIS. 53193, USA.
64TH ANNUAL MEETING OF THE FED. AM. SOC. EXP. BIOL., ANAHEIM, CALIF., USA, APR. 13-18, 1980. FED PROC 39 (3). 1980. ABSTRACT 507. Coden: FEPRA
Language: ENGLISH
Descriptors: ABSTRACT CAT MATHEMATICAL MODEL PHARMACOKINETICS
Concept Codes: GENL BIOL-SYMPOSIA,PROCDNGS,REVW(00520), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-LIPIDS(10066), BIOPHYS-BIOCYBERNETICS(10515), METABOLISM LIPIDS(•13006), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), ENDOCRINE SYST-GENERAL STUDIES(•17002), MUSCLE SYST-PHYSIOL,BIOCHEM(17504), PHARMACOL-DRUG METAB,METAB STIMU(22003), PHARMACOL-ENDOCRINE SYST(•22016), PHARMACOL-RESPIRATORY SYST(•22030), TISS CULTURE-APPARAT,METHS,MEDIA(32500), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: FELIDAE(85770)

19001050
DETERMINATION OF PULMONARY CAPILLARY PERMEABILITY MATHEMATICAL MODEL AND PHYSIOLOGIC MEASUREMENT
DEBSKI R F; BOROVETZ H S; MURPHY J J; LEVINE G; GRIFFITH B P; HARDESTY R L
DEP. SURG., UNIV. PITTSB. SCH. MED., 1088 SCAIFE HALL, PITTSBURGH, PA. 15261, USA.
64TH ANNUAL MEETING OF THE FED. AM. SOC. EXP. BIOL., ANAHEIM, CALIF., USA, APR. 13-18, 1980. FED PROC 39 (3). 1980. ABSTRACT 67. Coden: FEPRA
Language: ENGLISH
Descriptors: ABSTRACT SHEEP EXTRAVASCULAR LUNG VOLUME FREQUENCY DOMAIN PARAMETER IDENTIFICATION ANALYSIS FAST FOURIER TRANSFORMS
Concept Codes: GENL BIOL-SYMPOSIA,PROCDNGS,REVW(00520), MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(•10515), CARDIOVASC SYST-GENL STUDS,METHS(•14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(•14504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: BOVIDAE(85715)

18050897
FLOW TO LUNG COMPARTMENTS WITH DIFFERING TIME CONSTANTS
EPSTEIN R A; EPSTEIN M A F
1979 ANNUAL MEETING OF THE AMERICAN SOCIETY OF ANESTHESIOLOGISTS. ANESTHESIOLOGY 51 (3 SUPPL.). 1979. S386. Coden: ANESA
Language: ENGLISH
Descriptors: ABSTRACT MATHEMATICAL MODEL DISEASED LUNG
Concept Codes: GENL BIOL-SYMPOSIA,PROCDNGS,REVW(00520), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM GASES(10012), BIOPHYS-BIOCYBERNETICS(•10515), MOVEMENT(•12100), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), RESPIRATORY SYST-PATHOLOGY(•16006)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

18030859
METABOLIC MODEL FOR CADMIUM IN MAN
NORDBERG G F; KJELLSTROM T
DEP. COMM. HEALTH ENVIRON. MED., ODENSE UNIV., ODENSE, DEN.
INTERNATIONAL CONFERENCE ON ENVIRONMENTAL CADMIUM, BETHESDA, MD., USA, JUNE 7-9, 1978. ENVIRON HEALTH PERSPECT 28 (0). 1979. 211-218. Coden: EVHPA
Language: ENGLISH
Descriptors: LUNG INTESTINE BLOOD LIVER KIDNEY ACCUMULATION ESTIMATION MATHEMATICAL MODEL DIFFERENTIAL EQUATIONS EXCRETION BILE
Concept Codes: GENL BIOL-SYMPOSIA,PROCDNGS,REVW(00520), MATHEMATIC BIOL/STATISTIC METH(•04500), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(•10515), PHYSIOLOGY-METHODS(12006), MINERALS(•13010), DIGESTIVE SYST-PHYSIOL,BIOCHEM(14004), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), URIN SYST/EXT SECR-PHYSL,BIOCHEM(15504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), TOXICOL GENL EXP STUDS,METHS(•22501)
Biosystematic Codes: HOMINIDAE(86215)

18022423
IN-VIVO MEASUREMENT OF LUNG CAPILLARY WALL REFLECTION COEFFICIENTS TO SMALL HYDROPHILIC MOLECULES IN THE DOG
POCIDALO J J; QUEMADA D; SYROTA A; THEVEN D
HOP. CLAUDE BERNARD, INST. NATL. SANTE RECH. MED. UNITE 13, 75019 PARIS, FR.
PROCEEDINGS OF THE PHYSIOLOGICAL SOCIETY, LONDON, ENGLAND, FEB. 16-17, 1979. J PHYSIOL (LOND) 291 (O). 1979. 37P. Coden: JPHYA
Language: ENGLISH
Descriptors: UREA SODIUM CHLORIDE SUCROSE MATHEMATICAL MODEL
Concept Codes: GENL BIOL-SYMPOSIA,PROCDNGS,REVW(00520), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-GENERAL(1-0060), BIOCHEM STUD-CARBOHYDR.(10068), MINERALS(10069), BIOPHYS-MOLECUL PROP,MACROMOLEC(•10506), BIOPHYS-MEMBRANE PHENOMENA(•10508), BIOPHYS-BIOCYBERNETICS(10515), METABOLISM--GENL STUD,METAB PATHW(•13002), METABOLISM-CARBOHYDRATES(•1300-4), MINERALS(•13010), CARDIOVASC SYST-GENL STUDS,METHS(•14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(•14504), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHE-M(•16004)
Biosystematic Codes: CANIDAE(85765)

18011700
LUNG VASCULAR PERMEABILITY INFERENCES FROM MEASUREMENTS OF PLASMA TO LUNG LYMPH PROTEIN TRANSPORT
BRIGHAM K L; HARRIS T R; BOWERS R E; ROSELLI R J
VANDERBILT UNIV. HOSP., ROOM B-3211, NASHVILLE, TENN. 37232, USA.
LYMPHOLOGY 12 (3). 1979. 177-190. Coden: LYMPB
Language: ENGLISH
Descriptors: SHEEP PSEUDOMONAS ESCHERICHIA-COLI ENDO, TOXIN HISTAMINE SURFACE AREA REFLECTION COEFFICIENT HEMODYNAMICS MULTIPLE PORE THEORY MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-PROTEINS,PEPTIDES,AMINO ACD(10064), BIOCHEM STUD-LIPIDS(10066), BIOCHEM STUD-CARBOHYDR.(10068), BIOPHYS-G-ENERAL BIOPHYS TECH(10504), BIOPHYS-MOLECUL PROP,MACROMOLEC(1-0506), BIOPHYS-MEMBRANE PHENOMENA(•10508), BIOPHYS-BIOCYBERNE-TICS(10515), MOVEMENT(12100), PATHOLOGY-INFLAMMATN,INFLAM DIS(12508), METABOLISM-PROTNS,PEPTDS,AM ACDS(•13012), CARDIOV-ASC SYST-GENL STUDS,METHS(•14501), CARDIOVASC SYST-PHYSIOL,BI-OCHEM(•14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(•15002), BLOOD/BODY FLDS-LYMPHAT TISS,RES(•15008), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), ENDOCRINE SYST-GENERAL STUDIES(-17002), TOXICOL-GENL/EXP STUDS,METHS(22501), BACTERIA-PHYSIOL-OGY,BIOCHEMISTRY(31000), MED/CLIN MICROBIOL-BACTERIOLOGY(3600-2)
Biosystematic Codes: PSEUDOMONADACEAE(04716), ENTEROBACTERI-ACEAE(04810), BOVIDAE(85715)

68057417

BLOOD FLOW IN THE LUNG
COLLINS R; MACCARIO J A
UNIV. COPIEGNE, BP 233, 60206 COMPIEGNE, FR.
J BIOMECH 12 (5). 1979. 373-395. Coden: JBMCB
Language: ENGLISH
Descriptors: MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL STUDIES(•10502), BIOPHYS-BIOCYBERNETICS(•1051-5), MOVEMENT(12100), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(•14504), BLOOD/BODY FLDS-BLOO-D,LYMPH STUD(15002), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

68057416
LARGE DEFORMATION ANALYSES OF STRAINS IN EXCISED LOBES OF CANINE LUNG DURING DEFLATION EXPERIMENTS
PAO Y C; CHEVALIER P A; RODARTE J R
DEP. ENG. MECH., UNIV. NEBR., LINCOLN, NEBR. 68588, USA.
J BIOMECH 12 (5). 1979. 349-360. Coden: JBMCB
Language: ENGLISH
Descriptors: MATHEMATICAL MODEL STRAIN
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATI-STIC METH(04500), RADIATION BIOL-RADIN,ISOTOP TECH(06504), BIOCHEM-GASES(10012), BIOCHEM STUD-LIPIDS(10066), MINERALS(10-069), BIOPHYS-GENERAL STUDIES(•10502), BIOPHYS-BIOCYBERNETICS-(•10515), ANATOMY/HISTOL-EXPERIMENTAL(11104), CHORDATE BODY REGNS-THORAX(11312), PHYSIOLOGY-STRESS(12008), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM-(•16004), COELOM MEMBRANES,MESENTERIES,ETC(•18200)
Biosystematic Codes: CANIDAE(85765)

68051150
DUAL TRACER SINGLE BREATH STUDIES OF GAS TRANSPORT IN THE LUNG
ENGEL L A; PAIVA M; SIEGLER D I M; FUKUCHI Y
MEAKINS CHRISTIE LAB., R. VICTORIA HOSP., MCGILL UNIV. CLIN., MONTREAL, QUE., CAN.
RESPIR PHYSIOL 36 (2). 1979. 103-120. Coden: RSPYA
Language: ENGLISH
Descriptors: HUMAN MATHEMATICAL MODEL HELIUM SULFUR HEXA FLUORIDE COMPUTER
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(00530), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADIN,I-SOTOP TECH(06504), BIOCHEM-GASES(•10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOCYBERNETICS(•10515), PHYSIOLOGY-COMPARATIVE(12003), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: HOMINIDAE(86215)

68038144
USE OF AN EXPONENTIAL FUNCTION FOR ELASTIC RECOIL
COLEBATCH H-J H; NG C K Y; NIKOV N
DIV. THORAC. MED., SCH. MED., UNIV. N.S.W., KENSINGTON, N.S.W. 2033, AUST.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 46 (2). 1979. 387-393. Coden: JARPD
Language: ENGLISH
Descriptors: HUMAN MATHEMATICAL MODEL TOTAL LUNG CAPACITY COMPUTER AGE
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(+00530), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), GERONTOLOGY(24500)
Biosystematic Codes: HOMINIDAE(86215)

68023088
A 1 BRANCHING MODEL OF URETHANE CARCINOGENESIS AND ITS QUALITATIVE CONSISTENCY WITH EMPIRICAL FINDINGS
KLONECKI W
STAT. LAB., UNIV. CALIF., RIVERSIDE, CALIF., USA.
MATH BIOSCI 43 (1-2). 1979. 23-40. Coden: MABIA
Language: ENGLISH
Descriptors: ANIMAL CARCINOGEN LUNG TUMORS MATHEMATICAL MODEL POISSON FUNCTION
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM METH-GENERAL(10050), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-PATHOLOGY(+16006), ROUTES OF IMMUNIZ,INFECT,-THERAP(22100), TOXICOL-GENL/EXP STUDS,METHS(+22501), NEOPLSMS-/NEOPL AGNTS-CARCINOGENS(+24007)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700)

68006586
ULTRA HIGH SPEED TRANS AXIAL IMAGE RECONSTRUCTION OF THE HEART LUNGS AND CIRCULATION VIA NUMERICAL APPROXIMATION METHODS AND OPTIMIZED PROCESSOR ARCHITECTURE
GILBERT B K; CHU A; ATKINS D E; SWARTZLANDER E E JR; RITMAN E L
BIODYN. RES. UNIT, DEP. PHYSIOL. BIOPHYS., MAYO FOUND., ROCHESTER, MINN. 55901, USA.
COMPUT BIOMED RES 12 (1). 1979. 17-38. Coden: CBMRB
Language: ENGLISH
Descriptors: HUMAN THORAX MATHEMATICAL MODEL TOMOGRAPHY
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADIN,ISOTOP TECH(+06504), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-RADIOLOGIC(+11106), CHORDATE BODY REGNS-THORAX-(11312), CARDIOVASC SYST-ANATOMY(+14502), RESPIRATORY SYST GENL STUD,METHS(16001), RESPIRATORY SYST-ANATOMY(+16002)
Biosystematic Codes: HOMINIDAE(86215)

67055151
RADON-222 DAUGHTER DOSIMETRY IN THE SYRIAN GOLDEN HAMSTER LUNG
DESROSIERS A; KENNEDY A; LITTLE J B
YANKEE AT. ELECTR. CO., 20 TURNPIKE RD., WESTBORO, MASS. 01581, USA.
HEALTH PHYS 35 (5). 1978. 607-624. Coden HLTPA
Language: ENGLISH
Descriptors: HUMAN CLARA CELLS BASAL CELLS SUB SEGMENTAL BRONCHI BRONCHIOLE POLONIUM-218 POLONIUM-214 CARCINOGENESIS MORPHOMETRY MATHEMATICAL MODEL OCCUPATIONAL EXPOSURE
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), CYTOLOGY/CYTOCHEM-HUMAN(02508), MATHEMATIC BIOL/STATISTIC METH(04500), SUBTERRANEAN BIORESEARCH(06400), RADIATION BIOL-RADIN,ISOTOP TECH(06504), RADIATION BIOL-RADIN EFF,PROTECT(+06506), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-COMPARATIVE(11103), PATHOLOGY-COMPARATIVE(12503), MINERALS-(13010), RESPIRATORY SYST-ANATOMY(16002), RESPIRATORY SYST-PATHOLOGY(+16006), TOXICOL-GENL/EXP STUDS,METHS(+22501), TOXICOL-ENVIRONMNTL,INDUSTR(+22506), NEOPLSMS/NEOPL AGNTS CARCINOGENS(+24007), ENVIRON HEALTH-OCCUPAINL HEALTH(+37013), ENVIRON HEALTH-RADIATION HEALTH(+37017)
Biosystematic Codes: HOMINIDAE(86215), CRICETIDAE(86310)

67039866
TRANSFER AND DYNAMICS OF URIC-ACID IN THE PREGNANT RHESUS MONKEY PART 2 A MATHEMATICAL MODEL
VAN KREEL B K; WALLENBURG H C S
DEP. CHEM. PATHOL., ERASMUS UNIV., ROTTERDAM, NETH
EUR J OBSTET GYNECOL REPROD BIOL 8 (4). 1978. 219-226
Coden: EOGRA
Language: ENGLISH
Descriptors: LUNG
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADIN,ISOTOP TECH(06504), BIOCHEM STUD NUCL ACD,PURNS,PYRM(10062), BIOPHYS-MEMBRANE PHENOMENA(+10508), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), METABOLISM NUCL ACD,PURINS,PYRIM(+13014), CARDIOVASC SYST-GENL STUDS,METHS(14501), BLOOD/BODY FLDS-OTHER BODY FLDS(15010), URIN SYST/EXT SECR-PHYSL,BIOCHEM(15504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), REPRODUCT SYST-PHYSIOL,BIOCHEM(+16504), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), DEVELOPMNTL BIOL-EXPERIMENTAL(+25504)
Biosystematic Codes: CERCOPITHECIDAE(86205)

67005784
HOW RE BREATHING ANESTHETIC SYSTEMS CONTROL PULMONARY ARTERIAL PRESSURE STUDIES WITH A MECHANICAL AND MATHEMATICAL MODEL
KEENAN R; BOYAN C P
DEP. ANESTHESIOL., MED. COLL. VA., RICHMOND, VA. 23298, USA.
CAN ANAESTH SOC J 25 (2). 1978 117-121. Coden: CANJA
Language: ENGLISH
Descriptors: HUMAN ANESTHESIA MECHANICAL LUNG
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(+10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOENGINEERING(10511), BIOPHYS-BIOCYBERNETICS(+10515), PHYSIOLOGY-GENERAL STUDIES(12002), PATHOLOGY-THERAPY(12512), CARDIOVASC SYST-PHYSIOL,BIOCHEM(14504), BLOOD/BODY FLDS-BLOOD-,LYMPH STUD(+15002), RESPIRATORY SYST-GENL STUD,METHS(+16001), NERVOUS SYST-GENL STUDS,METHS(20501), PHARMACOL-NEUROPHARMACOLOGY(22024)
Biosystematic Codes: HOMINIDAE(86215)

17050154
CARCINOGENESIS BY THOROTRAST AND OTHER SOURCES OF IRRADIATION ESPECIALLY OTHER ALPHA EMITTERS
MOLE R H
ENVIRON RES 18 (1). 1979 192-215 Coden: ENVRA
Descriptors: BONE LUNG SARCOMA LEUKEMIA MATHEMATICAL MODEL HISTOLOGY
Concept Codes: CYTOLOGY/CYTOCHEM-HUMAN(+02508), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), RADIATION BIOL-RADTN EFF,PROTECT(+06506), COMPARATIVE BIOCHEM-GENL STUDIES(10010), MINERALS(10069), ANATOMY/HISTOL-MICRO,ULTRAMICRSC(+11108), DIGESTIVE SYST-PATHOLOGY(+14006), BLOOD/BODY FLDS-BLOOD CELL STUDS(15004), BLOOD/BODY FLDS-BLD,LYM,RES PATH(+15006), BLOOD/BODY FLDS-LYMPHAT TISS,RES(+15008), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(+16006), BONE,JNTS,FASC,CONN/ADIP-GENL(18001), BONE,JNTS,FASC,CONN/ADIP-PATHOL(+18006), TOXICOL-FOOD,RESIDS,ADDIT,PRESRV(+22502), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(+24007), NEOPLSMS/NEOPL AGNTS-BLOOD,RES(+24010)
Biosystematic Codes: HOMINIDAE(86215)

17046730
TRANSPORT PHENOMENA IN BIOLOGICAL SYSTEMS A NEW LOOK AT THE PROBLEM
REIS J F G
CIENC BIOL BIOL MOL CEL 3 (1). 1978 (RECD 1979) 78-88
Coden: CBBMC
Descriptors: ABSTRACT THERMODYNAMICS BLOOD RHEOLOGY TISSUE PERFUSION PHARMACO KINETICS LUNG MODELS DIALYSIS PROTEIN FRACTIONATION MATHEMATICAL MODELS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), BIOCHEM METH-PROTNS,PEPTDS,AM AC(10054), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(+12100), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), PHARMACOL-GENERAL STUDIES(22002)

17038730
THE TOXICOLOGY OF STYRENE MONOMER AND ITS PHARMACO KINETICS AND DISTRIBUTION IN THE RAT
WITHEY J R
SCAND J WORK ENVIRON HEALTH 4 (SUPPL 2) 1978 31-40
Coden: SWEHD
Descriptors: FOOD PACKAGING OCCUPATIONAL HEALTH HEART LIVER LUNG SPLEEN KIDNEY BRAIN FAT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(10515), METABOLISM-GENL STUD,METAB PATHW(+13002), FOOD TECH-EVALNS PHYS,CHEM PROPS(13530), FOOD TECH-PREP,PROCESSNG,STORAGE(13532), DIGESTIVE SYST-PHYSIOL,BIOCHEM(14004), CARDIOVASC SYST-PHYSIOL,BIOCHEM(14504), BLOOD/BODY FLDS-LYMPHAT TISS,RES(15008), URIN SYST/EXT SECR-PHYSL,BIOCHEM(15504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), BONE,JNTS,FASC,CONN/ADIP-PHY,BCH(18004), NERVOUS SYST PHYSIOL,BIOCHEM(20504), TOXICOL-FOOD,RESIDS,ADDIT,PRESRV(22502), TOXICOL-ENVIRONMNTL,INDUSTR(+22506), ENVIRON HEALTH OCCUPATNL HEALTH(37013)
Biosystematic Codes: MURIDAE(86375)

17029524
MUCO CILIARY CLEARANCE OF INHALED PARTICLES A MODEL APPROACH
GERRITY T R; LOURENCO R V
CLIN RES 26 (5). 1978 723A Coden: CLREA
Descriptors: ABSTRACT HUMAN LUNG ANATOMY CHRONIC BRONCHITIS CYSTIC FIBROSIS BRONCHI ECTASIS TRACHEAL TRANSPORT VELOCITY MATHEMATICAL MODEL
Concept Codes: GENETICS/CYTOGENET-HUMAN(+03508), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL STUDIES(10502), BIOPHYS GENERAL BIOPHYS TECH(10504), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOCYBERNETICS(10515), MOVEMENT(12100), PATHOLOGY-DIAGNOSTIC(12504), METABOLISM-METABOLIC DISORDERS(+13020), BLOOD/BODY FLDS-OTHER BODY FLDS(15010), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-ANATOMY(16002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), RESPIRATORY SYST-PATHOLOGY(+16006), TOXICOL-GENL/EXP STUDS,METHS(+22501), DEVELOPMNTL BIOL-PATHOLOGICAL(+25503)
Biosystematic Codes: HOMINIDAE(86215)

17028842
SOLUTE AND WATER TRANSFER IN FETAL AND NEW BORN LUNGS
OLVER R E
HODSON, W. ALAN (ED.). LUNG BIOLOGY IN HEALTH AND DISEASE, VOL. 6. DEVELOPMENT OF THE LUNG. XXII+646P. ILLUS. MARCEL DEKKER, INC.: NEW YORK, N.Y., USA; BASEL, SWITZERLAND. ISBN 0-8247-6377-7. 1977 (RECD 1979) 525-559 Coden: 07247
Descriptors: MATHEMATICAL MODEL CAPILLARY GAS EXCHANGE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-PHYSIOLOGL WATER STUD(•10011), BIOCHEM-GASES(10012), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(•10515), PHYSIOLOGY-COMPARATIVE(12003), MINERALS(•13010), CARDIOVASC SYST-PHYSIOL,-BIOCHEM(•14504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), PEDIATRICS(•25000), DEVELOPMNTL BIOL-GENL,DESCRIPTIVE(•25502), DEVELOPMNTL BIOL-GEN MORPHGENSIS(25508)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

17019824
IMPACTION OF CHARGED PARTICLES IN A BEND
SAVILONIS B J
JARON, DO: (ED.). PROCEEDINGS OF THE 6TH NEW ENGLAND BIOENGINEERING CONFERENCE, KINGSTON, R.I., USA, MAR. 23-24, 1978. XXI+421P. ILLUS. PERGAMON PRESS: NEW YORK, N.Y., USA; OXFORD, ENGLAND. ISBN 0-08-022678-7. 1978 (RECD 1979) 386-389 Coden: 07233
Descriptors: LUNG DEPOSITION INHALATION THERAPY AIR POLLUTION INDUSTRIAL HYGIENE MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-BIOENGINEERING(•10511), PATHOLOGY-THERAPY(•12512), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), ENVIRON HEALTH-OCCUPATNL HEALTH(•37013), ENVIRON HEALTH-AIR,WATR,SL POLLN(•37015)

17018000
SMALL SOLUTES AND WATER
EFFROS R M
STAUB, NORMAN C. (ED.). LUNG BIOLOGY IN HEALTH AND DISEASE, VOL. 7. LUNG WATER AND SOLUTE EXCHANGE. XIII+568P. ILLUS. MARCEL DEKKER, INC.: NEW YORK, N.Y., USA; BASEL, SWITZERLAND. ISBN 0-8247-6379-3. 1978 (RECD 1979) 183-231 Coden: 07248
Descriptors: LUNG MEMBRANE MATHEMATICAL MODEL CAPILLARY EXCHANGE OSMOTIC BUFFERING TRACER PERMEABILITY
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), BIOCHEM-PHYSIOLOGL WATER STUD(•10011), MINERALS(10069), BIOPHYS-MEMBRANE PHENOMENA(•10508), BIOPHYS-BIOCYBERNETICS(•10515), MINERALS(•13010), CARDIOVASC SYST-PHYSIOL,BIOCHEM(•14504), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

17017997
MATHEMATICAL MODELING OF STEADY-STATE FLUID AND PROTEIN EXCHANGE IN LUNG
BLAKE L H
STAUB, NORMAN C. (ED.). LUNG BIOLOGY IN HEALTH AND DISEASE, VOL. 7. LUNG WATER AND SOLUTE EXCHANGE. XIII+568P. ILLUS. MARCEL DEKKER, INC.: NEW YORK, N.Y., USA; BASEL, SWITZERLAND. ISBN 0-8247-6379-3. 1978 (RECD 1979) 99 Coden: 07248
Descriptors: MEMBRANE VASCULAR EXCHANGE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-PROTEINS,PEPTIDES,AMINO ACD(10064), BIOPHYS-BIOCYBERNETICS(•10515), METABOLISM-PROTNS,PEPTDS,AM ACDS(•13012), CARDIOVASC SYST-PHYSIOL,BIOCHEM(•14504), BLOOD/BODY FLDS-OTHER BODY FLDS(•15010), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

17005835
A MATHEMATICAL MODEL TO EXPLAIN THE DIFFERENTIAL EFFECTS OF ELASTASE ON LUNG VOLUMES OF RAPIDLY GROWING AND MATURE LUNGS
LUCEY E C; KARLINSKY J B; SNIDER G L
FED PROC 38 (3 PART 1). 1979 1324 Coden: FEPRA
Descriptors: ABSTRACT HAMSTER PORCINE PANCREATIC
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM STUD-PROTEINS,PEPTIDES,AMINO ACD(10064), BIOPHYS-GENERAL STUDIES(10502), BIOPHYS-BIOENGINEERING(10511), BIOPHYS-BIOCYBERNETICS(•10515), ENZYMES METHODS(10804), ENZYMES-PHYSIOLOGICAL STUDIES(•10808), DIGESTIVE SYST-PHYSIOL,BIOCHEM(14004), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(•16006), TOXICOL-GENL/EXP STUDS,METHS(•22501)
Biosystematic Codes: SUIDAE(85740), CRICETIDAE(86310)

17005834
DIFFUSIVE AND CONVECTIVE MIXING IN THE LUNG AS PARALLEL CONDUCTANCES
VAN LIEW H D; SPONHOLTZ D K
FED PROC 38 (3 PART 1). 1979 1324 Coden: FEPRA
Descriptors: ABSTRACT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOENGINEERING(•10511), BIOPHYS-BIOCYBERNETICS(•10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)

16049886
CONVECTIVE FLOWS IN MAMMALIAN LUNGS
SCHROTER R C
SCHMIDT-NIELSEN, KNUT., LIANA BOLIS AND S. H. P. MADDRELL (ED.). COMPARATIVE PHYSIOLOGY: WATER, IONS AND FLUID MECHANICS. THIRD INTERNATIONAL CONFERENCE ON COMPARATIVE PHYSIOLOGY. CRANS-SUR-SIERRE, SWITZERLAND. SEPT. 1976. XI+360P. ILLUS. CAMBRIDGE UNIVERSITY PRESS: NEW YORK, N.Y., USA; CAMBRIDGE, ENGLAND. ISBN 0-521-21696-6. 1978 303-325 Coden: 06861
Descriptors: MATHEMATICAL MODEL FLUID MECHANICS
Concept Codes: BIOCHEM-GASES(+10012), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700)

16042579
NORMALITY OF RADIO PHARMACEUTICAL DISTRIBUTION DATA
KROHN K A; HINES H H
J NUCL MED 19 (6). 1978 688 Coden: JNMEA
Descriptors: ABSTRACT MOUSE LIVER LUNG TUMOR UPTAKE IODINE-131 BLEOMYCIN DIAGNOSTIC-DRUG GALLIUM-67 CITRATE IODINE-131 FIBRINOGEN UPTAKE MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(+06504), BIOCHEM STUD-PROTEINS,PEPTIDES,AMINO ACD(10064), BIOCHEM STUD-CARBOHYDR.(10068), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(+10515), PATHOLOGY-DIAGNOSTIC(+12504), METABOLISM-CARBOHYDRATES(+13004), MINERALS(+13010), METABOLISM-PROTNS,PEPTDS,AM ACDS(+13012), DIGESTIVE SYST-PHYSIOL,BIOCHEM(+14004), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), PHARMACOL-GENERAL STUDIES(+22002), PHARMACOL-DRUG METAB,METAB STIMU(+22003), NEOPLSMS/NEOPL AGNTS-DIAGNS METH(+24001)
Biosystematic Codes: MURIDAE(86375)

16020942
A MATHEMATICAL MODEL OF PLUTONIUM-238 ALPHA-RAY DOSE RATE DISTRIBUTION IN THE LUNG
FELDMAN C; BODOR P; PEREZ L J JR; HENRY S
SANDERS, C. L. ET AL. (ED.). ERDA (ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION) SYMPOSIUM SERIES, VOL. 43. PULMONARY MACROPHAGE AND EPITHELIAL CELLS. PROCEEDINGS OF THE 16TH ANNUAL HANFORD BIOLOGY SYMPOSIUM. RICHLAND, WASH., USA, SEPT. 27-29, 1976. IX+618P. ILLUS. TECHNICAL INFORMATION CENTER, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION: OAK RIDGE, TENN., USA. (AVAILABLE AS CONE-760927 FROM NATIONAL TECHNICAL INFORMATION SERVICE, US DEPARTMENT OF COMMERCE, SPRINGFIELD, VA., USA. ISBN 0-87079-204-0. 1977 (RECD 1978) 475-495 Coden: 06495
Descriptors: RAT PHOTO MICROGRAPHY MONTE-CARLO TECHNIQUE
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(+01012), MICROSCOPY-GENL,SPECL TECHNIQUES(01052), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(+06504), RADIATION BIOL-RADTN EFF,PROTECT(+06506), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-RADIOLOGIC(+11106), ANATOMY/HISTOL-MICRO,ULTRAMICRSC(11108), MINERALS(+13010), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: MURIDAE(86375)

16014672
QUANTITATIVE ASPECTS OF THE MIGRATION AND DEVELOPMENTAL ASYNCHRONISM OF SCHISTOSOMA-MANSONI IN MICE
BARBOSA M A; PELLEGRINO J; COELHO P M Z; SAMPAIO I B M
REV INST MED TROP SAO PAULO 20 (3). 1978 121-132 Coden: RMTSA
Descriptors: MUS-MUSCULUS MATHEMATICAL MODEL PORTAL SYSTEM SKIN LUNGS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), CIRCADIAN RHYTHM/PERIODIC CYCLES(+07200), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), CARDIOVASC SYST-HEART PATHOLOGY(14506), RESPIRATORY SYST-PATHOLOGY(16006), INTEGUMENT SYST-GENL STUDS,METHS(18501), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), DEVELOPMNTL BIOL-GENL,DESCRIPTIVE(25502), DEVELOPMNTL BIOL-GEN MORPHGENSIS(+25508), PARASITOLOGY-GENERAL(+60502), INVERTB PHYSIOL-PLATYHELMINTHES(+64010)
Biosystematic Codes: TREMATODA(45200), MURIDAE(86375)

66067989
THE INERTIAL BEHAVIOR OF FIBERS
BURKE W A; ESMEN N
P.O. BOX 291, ROSENDALE, N.Y. 12472, USA.
AM IND HYG ASSOC J 39 (5). 1978 400-405. Coden: AIHAA
Language: ENGLISH
Descriptors: MATHEMATICAL MODEL LUNG HEALTH IMPLICATIONS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM METH-MINERALS(10059), MINERALS(+10069), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-PATHOLOGY(+16006), TOXICOL-GENL/EXP STUDS,METHS(+22501)

65073769
A SIMPLE MATHEMATICAL LUNG MODEL FOR QUANTITATIVE REGIONAL VENTILATION MEASUREMENT USING KRYPTON-81M
BAJZER Z; NOSIL J
DEP. NUCL. APPL. PHYS., RUDJER BOSKOVIC INST., ZAGREB, YUGOSL.
PHYS MED BIOL 22 (5). 1977 975-980. Coden: PHMBA
Language: ENGLISH
Descriptors: HUMAN COMPUTERIZED GAMMA CAMERA
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(+10515), PHYSIOLOGY-INSTRUMENTATION(12004), METABOLISM-GENL STUD,METAB PATHW(+13002), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: HOMINIDAE(86215)

65036811
LUNG SURFACE TENSION AND AIR SPACE DIMENSIONS FROM MULTIPLE PRESSURE VOLUME CURVES
VALBERG P A; BRAIN J D
DEP. PHYSIOL., HARV. UNIV. SCH. PUBLIC HEALTH, BOSTON, MASS. 02115, USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 43 (4). 1977 730-738. Coden: JARPD
Language: ENGLISH
Descriptors: CAT DOG RABBIT RAT TWEEN 20 MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(+10012), BIOCHEM STUD-GENERAL(10060), BIOCHEM STUD-LIPIDS(10066), MINERALS(10069), BIOPHYS-GENERAL STUDIES(-10502), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOCYBERNETICS(10515), PHYSIOLOGY-COMPARATIVE(12003), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-ANATOMY(16002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: CANIDAE(85765), FELIDAE(85770), LEPORIDAE(86040), MURIDAE(86375)

65036713
INACTIVATION AND MUTATION OF CULTURED MAMMALIAN CELLS BY ALUMINUM CHARACTERISTIC ULTRA SOFT X-RAYS PART 3 IMPLICATIONS FOR THEORY OF DUAL RADIATION ACTION
GOODHEAD D T
MED. RES. COUNC. RADIOBIOL. UNIT, HARWELL, DIDCOT OX11 ORD, OXON, ENGL., UK.
INT J RADIAT BIOL RELAT STUD PHYS CHEM MED 32 (1). 1977 43-70. Coden: IJRBA
Language: ENGLISH
Descriptors: CHINESE HAMSTER LUNG V-79 CELL HUMAN DI PLOID FIBROBLAST HF-19 CELL HELIUM ION THIO GUANINE MATHEMATICAL MODEL MUTATION INDUCTION
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(+02506), CYTOLOGY/CYTOCHEM-HUMAN(+02508), GENETICS/CYTOGENET-ANIMAL(+03506), GENETICS/CYTOGENET-HUMAN(+03508), MATHEMATIC BIOL/STATISTIC METH(+04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), RADIATION BIOL-RADTN EFF,PROTECT(+06506), BIOCHEM STUD-NUCL ACD,PURNS,PYRM(10062), MINERALS(10069), BIOPHYS-BIOCYBERNETICS(10515), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), BONE,JNTS,-FASC,CONN/ADIP-PHY,BCH(18004), TISS CULTURE-APPARAT,METHS,MEDIA(32500), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: HOMINIDAE(86215), CRICETIDAE(86310)

65030359
BEHAVIOR OF ARTIFICIALLY PRODUCED HOLES IN LUNG PARENCHYMA
LAI-FOOK S J; HYATT R E; RODARTE J R; WILSON T A
DEP. PHYSIOL. AND BIOPHYS., MAYO CLIN., ROCHESTER, MINN. 55901, USA.
J APPL PHYSIOL RESPIR ENVIRON EXERCISE PHYSIOL 43 (4). 1977 648-655. Coden: JARPD
Language: ENGLISH
Descriptors: DOG SHEAR MODULUS MATHEMATICAL MODEL CONTINUUM MECHANICS
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), MINERALS(10069), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-MOLECUL PROP,MACROMOLEC(10506), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-EXPERIMENTAL(11104), RESPIRATORY SYST GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(+16006), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: CANIDAE(85765)

65028156
METHOD FOR QUANTITATING TUMOR CELL REMOVAL AND TUMOR CELL INVASIVE CAPACITY IN EXPERIMENTAL METASTASES
LIOTTA L A; DELISI C
LAB. PATHOL. THEOR. BIOL., NATL. CANCER INST., BETHESDA, MD. 20014, USA.
CANCER RES 37 (11). 1977 4003-4008. Coden: CNREA
Language: ENGLISH
Descriptors: LUNG METASTASES MATHEMATICAL MODEL
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), BIOPHYS-BIOCYBERNETICS(+10515), MOVEMENT(12100), CARDIOVASC SYST-GENL STUDS,METHS(14501), BLOOD/BODY FLDS-LYMPHAT TISS,RES(+15008), RESPIRATORY SYST-PATHOLOGY(+16-006), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), NEOPLSMS/NEOPL AGNTS-PATH,CLINIC(+24004), NEOPLSMS/NEOPL AGNTS-CELL LINE(240-05), TISS CULTURE-APPARAT,METHS,MEDIA(32500)
Biosystematic Codes: CHORDATA-UNSPECIFIED(85000)

65023938
EFFECT OF TIME ON THE DETERMINATION OF THE CLEARANCE RATES OF INSOLUBLE PLUTONIUM-239 OXIDE
METIVIER H; MASSE R; NOLIBE D; LAFUMA J
LAB. TOXICOL. EXP., DEP. PROT., COMMIS. ENERG., AT., BP 561, 92542 MONTROUGE CEDEX, FR.
HEALTH PHYS 32 (5). 1977 447-449. Coden: HLTPA
Language: ENGLISH
Descriptors: BABOON LUNG BEAGLE 3 COMPARTMENTAL MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), RADIATION BIOL-RADTN, ISOTOP TECH(06504), RADIATION BIOL-RADIN EFF, PROTECT(*06506), MINERALS(10069), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-DIAGNOSTIC(12504), MINERALS(*13010), RESPIRATORY SYST-GENL STUD, METHS(16001), TOXICOL-ENVIRONMNTL, INDUSTR(*22506), ENVIRON HEALTH-AIR, WATR, SL POLLN(37015), ENVIRON HEALTH-RADIATION HEALTH(*37017)
Biosystematic Codes: CANIDAE(85765), CERCOPITHECIDAE(86205)

15046830
ALTERATIONS OF LUNG ELASTICITY IN MODEL SYSTEMS OF CONNECTIVE TISSUE DAMAGE
SKALAK R; BIENIEK M P; KARAKAPLAN A; TURINO G M
AM REV RESPIR DIS 117 (4 PART 2). 1978 398 Coden: ARDSB
Descriptors: ABSTRACT HUMAN EMPHYSEMA ELASTASE DIGESTION COMPUTERIZED MATHEMATICAL MODEL ALVEOLAR WALL DISTENSIBILITY
Concept Codes: GENL BIOL-INFRMIN, DOCU, COMP APPL(*00530), BIOCHEM STUD-PROTEINS, PEPTIDES, AMINO ACD(10064), BIOPHYS-BIOCYBERNETICS(*10515), ENZYMES-PHYSIOLOGICAL STUDIES(10808), RESPIRATORY SYST-GENL STUD, METHS(*16001), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

15040767
EXTRAPOLATION OF CARCINOGENIC RISK FROM ANIMAL EXPERIMENTS TO MAN
EHRENBERG L; HOLMBERG B
ENVIRON HEALTH PERSPECT 22. 1978 33-35 Coden: EVHPA
Descriptors: ENVIRONMENTAL EXPOSURE LUNG CANCER MATHEMATICAL MODEL MUTATION
Concept Codes: GENETICS/CYTOGENET-ANIMAL(*03506), GENETICS/CYTOGENET-HUMAN(*03508), MATHEMATIC BIOL/STATISTIC METH(04500), SOCIAL BIOL/HUMAN ECOLOGY(05500), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-PATHOLOGY(*16006), TOXICOL-GENL/EXP STUDS, METHS(*22501), TOXICOL-ENVIRONMNTL, INDUSTR(*22506), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(*24007), ENVIRON HEALTH-AIR, WATR, SL POLLN(*37015)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700), HOMINIDAE(86215)

15038904
AN ANALYSIS OF SYNERGISTIC SENSITIZATION
LEENHOUTS H P; CHADWICK K H
BR J CANCER 37 (SUPPL 3). 1978 198-201 Coden: BJCAA
Descriptors: RAT CHINESE HAMSTER V-79 LUNG CELLS 9-L BRAIN TUMOR CELLS RADIO THERAPY MATHEMATICAL MODEL DRUG TREATMENT
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(*02506), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN, ISOTOP TECH(*06504), RADIATION BIOL-RADIN EFF, PROTECT(*06506), BIOCHEM STUD-GENERAL(10060), BIOCHEM STUD-NUCL ACD, PURNS, PYRM-(10062), BIOPHYS-MOLECUL PROP, MACROMOLEC(10506), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-THERAPY(12512), RESPIRATORY SYST-GENL STUD, METHS(16001), NERVOUS SYST-PATHOLOGY(*20506), PHARMACOL-NEUROPHARMACOLOGY(*22024), PHARMACOL-RESPIRATORY SYST(22030), NEOPLSMS/NEOPL AGNTS-CELL LINE(*24005), NEOPLSMS/NEOPL AGNTS-THERAP, AGNT(*24008), TISS CULTURE-APPARAT, METHS, MEDIA(32500), CHEMOTHERAPY-GEN STUD, METH, METAB(*38502)
Biosystematic Codes: CRICETIDAE(86310), MURIDAE(86375)

15037272
MASS TRANSFER MODELING FOR MEMBRANE OXYGENATORS
DORSON W J JR
KENEDI, R. M. ET AL. (ED.). STRATHCLYDE BIOENGINEERING SEMINARS, VOL. 2. ARTIFICIAL ORGANS. PROCEEDINGS OF A SEMINAR ON THE CLINICAL APPLICATIONS OF MEMBRANE OXYGENATORS AND SORBENT-BASED SYSTEMS IN KIDNEY AND LIVER FAILURE AND DRUG OVERDOSE. GLASGOW, SCOTLAND, AUG., 1976. XXVIII+450P. ILLUS. UNIVERSITY PARK PRESS: BALTIMORE, MD., USA; MACMILLAN PRESS LTD.: LONDON, ENGLAND. ISBN 0-8391-0999-7. 1977 33-49
Coden: 06390
Descriptors: LUNG GAS EXCHANGE MATHEMATICAL MODEL
Concept Codes: BIOCHEM-GASES(*10012), BIOPHYS-BIOENGINEERING(*10511), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-GENL STUD, METHS(*16001)

78048576
A MATHEMATICAL MODEL OF LUNG
PALLOTTI G; PALLOTTI C
PHYS MED BIOL 22 (1). 1977 136 Coden: PHMBA
Descriptors: ABSTRACT VENTILATION
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOPHYS-BIOENGINEERING(*10511), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-GENL STUD, METHS(*16001), RESPIRATORY SYST-PHYSIOL, BIOCHEM(16004)

78044482
DITHIONITE METHOD FOR LUNG DIFFUSING CAPACITY FOR OXYGEN EFFECTS OF INHOMOGENEITIES IN THE DISTRIBUTIONS OF DIFFUSING CAPACITY FOR OXYGEN ALVEOLAR VOLUME AND VENTILATION
SHEPARD R H; BURNS B
FED PROC 37 (3). 1978 906 Coden: FEPRA
Descriptors: ABSTRACT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), BLOOD/-BODY FLDS-BLOOD,LYMPH STUD(*15002), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)

78039699
REGIONAL DYNAMIC BEHAVIOR OF XENON-133 IN THE LUNG FOLLOWING DUAL BOLUS INJECTION
MITCHELL R R; FALLAT R J
CLIN RES 25 (3). 1977 421A Coden: CLREA
Descriptors: ABSTRACT HUMAN RESPIRATORY INSUFFICIENCY MATHEMATICAL MODEL COMPUTER SIMULATION
Concept Codes: GENL BIOL-INFRMIN,DOCU,COMP APPL(*00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(*06504), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

78032115
STATIC AND DYNAMIC BEHAVIOR OF THE LUNGS AFTER THEOPHYLLINE
KAMBUROFF P L; MARCHI E; NUMEROSO R; ALLEGRA L
BULL EUR PHYSIOPATHOL RESPIR 13 (4). 1977 126P Coden: BEPRD
Descriptors: ABSTRACT HUMAN AUTONOMIC-DRUG ASTHMA BRONCHITIS LUNG MATHEMATICAL MODEL
Concept Codes: BIOCHEM STUD-NUCL ACD,PURNS,PYRM(10062), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-THERAPY(12512), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PATHOLOGY(*16006), PHARMACOL-CLINICAL PHARMACOL(22005), PHARMACOL-NEUROPHARMACOLOGY(*22024), PHARMACOL-RESPIRATORY SYST(*22030)
Biosystematic Codes: THEACEAE(26845), HOMINIDAE(86215)

78012307
QUANTITATIVE EVALUATION OF XENON-133 LUNG WASHOUT CURVES USING A SCINTILLATION CAMERA
KOMENDA S; WIEDERMANN M; HUSAK V; ORAL I; TESARIKOVA E
ANDRYSEK, O. AND J. MESTAN (ED.). PROCEEDINGS OF THE IIIRD INTERNATIONAL SYMPOSIUM ON NUCLEAR MEDICINE. KARLOVY VARY, CZECHOSLOVAKIA, MAY 29-JUNE 1, 1973. 601P. ILLUS. CHARLES UNIVERSITY: PRAGUE, CZECHOSLOVAKIA. 1974 (1976) 49-53
Coden: 05756
Descriptors: HUMAN COMPUTER MATHEMATICAL MODEL
Concept Codes: GENL BIOL-INFRMIN,DOCU,COMP APPL(*00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(*06504), BIOCHEM-GASES(10012), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOENGINEERING(10511), RESPIRATORY SYST-GENL STUD,METHS(*16001)
Biosystematic Codes: HOMINIDAE(86215)

78009444
CHARACTERIZATION OF OUABAIN RESISTANT MUTATIONS IN CHINESE HAMSTER CELLS
CHANG C C; TROSKO J E
GENETICS 86 (2 PART 2). 1977 S11 Coden: GENTA
Descriptors: ABSTRACT V-79 LUNG FIBROBLASTS CAFFEINE CYCLOHEXIMIDE MUTAGENS RUBIDIUM-86 UPTAKE MATHEMATICAL MODEL
Concept Codes: MICROSCOPY-CYTOLOG,CYTOCHEM TECH(01054), CYTOLOGY/CYTOCHEM-ANIMAL(*02506), GENETICS/CYTOGENET-ANIMAL(*03506), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), RADIATION BIOL-RADTN EFF,PROTECT(*06506), BIOCHEM STUD-NUCL ACD,PURNS,PYRM(10062), BIOCHEM STUD-STEROLS,STEROIDS(10067), MINERALS(10069), BIOPHYS-MOLECUL PROP,MACROMOLEC(*10506), BIOPHYS-BIOCYBERNETICS(*10515), ANATOMY/HISTOL-MICRO,ULTRAMICRSC(11108), TOXICOL-GENL/EXP STUDS,METHS(*22501)
Biosystematic Codes: PLANTAE-UNSPECIFIED(11000), APOCYNACEAE(25580), CRICETIDAE(86310), ABSTRACTS OF MYCOLOGY(95000)

64058177
THE MULTI STAGE THEORY OF CARCINOGENESIS
MOOLGAVKAR S H
INT J CANCER 19 (5). 1977 730. Coden: IJCNA
Descriptors: HUMAN EPIDEMIOLOGY MATHEMATICAL MODEL GAMMA DISTRIBUTION GAUSSIAN DISTRIBUTION ACUTE LEUKEMIA HODGKINS DISEASE LUNG CANCER
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), SOCIAL BIOL/HUMAN ECOLOGY(05500), BIOPHYS-BIOCYBERNETICS(*10515), BLOOD/BODY FLDS-BLD,LYM,RES PATH(*15006), BLOOD/BODY FLDS-LYMPHAT TISS,RES(*15008), RESPIRATORY SYST-PATHOLOGY(*16006), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(*24007), NEOPLSMS/NEOPL AGNTS-BLOOD,RES(*24010), PUB HEALTH-ADMINISTR,STATISTICS(37010), EPIDEMIOL-ORGANIC DIS,NEOPLASMS(*37054)
Biosystematic Codes: HOMINIDAE(86215)

64055560
CARBON MON OXIDE EXCHANGES BETWEEN THE HUMAN FETUS AND MOTHER A MATHEMATICAL MODEL
HILL E P; HILL J R; POWER G G; LONGO L D
AM J PHYSIOL 232 (3). 1977 NO PAGE. Coden: AJPHA
Descriptors: HEART LUNG PLACENTA AIR POLLUTION EXERCISE HIGH ALTITUDE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), ECOLOGY-BIOCLIMATOL,BIOMETEOROL(07504), BIOCHEM-GASES(10012), BIOCHEM STUD-PROTEINS,PEPTIDES,AMINO ACD(10064), BIOCHEM STUD-PORPHYRNS,BILE PIGM(10065), BIOPHYS-BIOCYBERNETICS(*1051-5), EXTERN EFF-PRESSURE(10606), PHYSIOLOGY-EXERCISE,PHYS THERAP(12010), METABOLISM-ENERGY,RESPIRATION(*13003), CARDIOV-ASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD CELL STUDS(*15004), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), REPRODUCT SYST-PHYSIOL,BIOCHEM(*16504), TOXICOL-ENVIRONMNTL,I-NDUSTR(*22506), DEVELOPMNTL BIOL-PATHOLOGICAL(*25503), DEVELOPMNTL BIOL-EXPERIMENTAL(25504), ENVIRON HEALTH-AIR,WATR-,SL POLLN(*37015)
Biosystematic Codes: HOMINIDAE(86215)

64035594
AN ATTEMPT TO EVALUATE QUANTITATIVELY XENON-133 LUNG WASHOUT CURVES USING A COMPUTER
KOMENDA S; WIEDERMANN M; TESARIKOVA E; HUSAK V
ACTA UNIV PALACKI OLOMUC FAC MED 76 1976 (RECD 1977) 319-342. Coden: AUPMA
Descriptors: HUMAN LUNG DISEASE SCINTILLATION CAMERA MATHEMATICAL MODEL
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(*00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(06504), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(*10515), PHYSIOLOGY-INSTRUMENTATION(12004), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

64033724
MULTI HIT KINETICS OF TUMOR FORMATION WITH SPECIAL REFERENCE TO EXPERIMENTAL LIVER AND HUMAN LUNG CARCINOGENESIS AND SOME GENERAL CONCLUSIONS
EMMELOT P; SCHERER E
CANCER RES 37 (6). 1977 1702-1708. Coden: CNREA
Descriptors: RAT DI ETHYL NITROSAMINE CARCINOGEN SMOKING MATHEMATICAL MODEL
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MATHEMATIC BIOL/STATISTIC METH(04500), SOCIAL BIOL/HUMAN ECOLOGY(05500), BEHAVIOR BIOL-HUMAN BEHAVIOR(07004), BIOCHEM STUD-GENERAL(100-60), BIOPHYS-BIOCYBERNETICS(*10515), DIGESTIVE SYST-PATHOLOGY-(*14006), RESPIRATORY SYST-PATHOLOGY(*16006), PSYCHIATRY-ADDI-CTION(INC SMOKNG)(*21004), ROUTES OF IMMUNIZ,INFECT,THERAP(22-100), TOXICOL-GENL/EXP STUDS,METHS(*22501), TOXICOL ENVIRONMNTL,INDUSTR(22506), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(*24007), PUB HEALTH-ADMINISTR,STATISTICS(37010), EPIDEMIOL-ORGANIC DIS,NEOPLASMS(37054), PLANT PHYSIOL-CHEM CONSTITUENTS(51522)
Biosystematic Codes: PLANTAE-UNSPECIFIED(11000), HOMINIDAE(86215), MURIDAE(86375)

64023586
ADAPTIVE TECHNIQUE FOR ESTIMATING THE PARAMETERS OF A NONLINEAR MATHEMATICAL LUNG MODEL
NADA M D; LINKENS D A
MED BIOL ENG COMPUT 15 (2). 1977 149-154. Coden: MBECD
Descriptors: DIGITAL SIMULATION ELASTANCE RESISTANCE
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(*00530), MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOENERGETICS(*10510), CHORDATE BODY REGNS-THORAX(11312), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)

63049793
CELLULAR AND GEOMETRIC CONTROL OF TISSUE GROWTH AND MITOTIC INSTABILITY
SHYMKO R M; GLASS L
J THEOR BIOL 63 (2). 1976 355-374. Coden: JTBIA
Descriptors: CHINESE HAMSTER LUNG V-79 CELLS MATHEMATICAL MODEL DIFFUSIBLE MITOTIC INHIBITOR
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(*02506), MATHEMATIC BIOL/STATISTIC METH(*04500), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), NUTRITION-GENL,NUTR STATUS,METHS(13202), CARDIOVASC SYST-GENL STUDS,METHS(14501), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), PHARMACOL-DRUG METAB,METAB STIMU(22003), NEOPLSMS/NEOPL AGNTS-BIOCHEM(24006), DEVELOPMNTL BIOL-GEN MORPHGENSIS(*25508), TISS CULTURE-APPARAT,METHS,MEDIA(32500), IN VITRO STUDS-CELLULR,SUBCELL(32600)
Biosystematic Codes: CRICETIDAE(86310)

63047577
EFFECTS OF THE FREQUENCY CONTENT IN COMPLEX AIR SHOCK WAVES ON LUNG INJURIES IN RABBITS
CLEMEDSON C-J; JONSSON A
AVIAT SPACE ENVIRON MED 47 (11). 1976 1143-1152. Coden: ASEMC
Descriptors: HUMAN MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(10012), BIOPHYS-BIOCYBERNETICS(10515), EXTERN EFF-PRESSURE(10606), EXTERN EFF-PHYSICAL,MECH EFFECTS(+10612), CHORDATE BODY REGNS-THORAX(11312), MOVEMENT(12100), RESPIRATORY SYST-PATHOLOGY(+16006), ENVIRON HEALTH-MISCELL STUDS(+37019)
Biosystematic Codes: LEPORIDAE(86040), HOMINIDAE(86215)

63036277
METHOD OF COMPUTING EXCESSIVE PRESSURE IN HUMAN LUNGS IN SPACE CABIN DECOMPRESSION
YAKOVLENKO V S
KOSM BIOL AVIAKOSM MED 10 (5). 1976 62-68. Coden: KBAMA
Descriptors: PULMONARY POSITIVE PRESSURE MATHEMATICAL MODEL
Concept Codes: GENL BIOL-INFRMIN,DOCU,COMP APPL(00530), MATHEMATIC BIOL/STATISTIC METH(04500), AEROSP/UNDRWATR BIOL-PHYSIOL,MED(+06006), BIOCHEM-GASES(10012), BIOPHYS-BIOEN-GINFERING(10511), BIOPHYS-BIOCYBERNETICS(+10515), EXTERN EFF-PRESSURE(+10606), MOVEMENT(12100), RESPIRATORY SYST-PHYSI-OL,BIOCHEM(+16004)
Biosystematic Codes: HOMINIDAE(86215)

63035704
STATIC MECHANICAL LUNG PROPERTIES IN HEALTHY CHILDREN
BARAN D; YERNAULT J C; PAIVA M; ENGLERT M
SCAND J RESPIR DIS 57 (3). 1976 139-147. Coden: SJRDA
Descriptors: SIGMOID MATHEMATICAL MODEL QUASI STATIC METHOD HEIGHT AGE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(+10515), PHYSIOLOGY-GENERAL STUDIES(12-002), PHYSIOLOGY-COMPARATIVE(12003), RESPIRATORY SYST GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), PEDIATRICS(+25000)
Biosystematic Codes: HOMINIDAE(86215)

63016669
STOCHASTIC MODEL OF METASTASES FORMATION
LIOTTA L A; SAIDEL G M; KLEINERMAN J
BIOMETRICS 32 (3). 1976 535-550. Coden: BIOMA
Descriptors: MOUSE FIBRO SARCOMA LUNG METASTASES MATHEMATICAL MODEL CARCINOGENESIS SURGERY
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-SURGERY(11105), MOVEMENT(12100), PATHOLOGY-THERAPY(12512), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(14504), BLOOD/BODY FLDS LYMPH-AT TISS,RES(+15008), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(+16006), BONE,JNTS,FASC,CONN/ADIP GENL(18001), BONE,JNTS,FASC,CONN/ADIP-PATHOL(+18006), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), NEOPLSMS/NEOPL AGNTS CELL LINE(24005), NEOPLSMS/NEOPL AGNTS-CARCINOGENS(+24007), NEOPLSMS/NEOPL AGNTS-THERAP,AGNT(+24008), TISS CULTURE-APPARA-T,METHS,MEDIA(32500)
Biosystematic Codes: MURIDAE(86375)

77074747
A THEORY OF PRESSURE VOLUME HYSTERESIS IN LUNGS
NIELSON D
TEX REP BIOL MED 33 (4). 1975 (RECD 1976) 597 Coden: TRBMA
Descriptors: ABSTRACT PULMONARY DISEASE MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL STUDIES(+10502), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700)

77037090
PULMONARY IMPEDANCE AS A FUNCTION OF BREATHING FREQUENCY IN OBSTRUCTIVE LUNG DISEASE
OSTRANDER L E; CHESTER E H; FRIEDMAN B A
FED PROC 36 (3). 1977 616 Coden: FEPRA
Descriptors: ABSTRACT HUMAN SIMPLE SERIES RESISTANCE COMPLIANCE MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(+10515), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: HOMINIDAE(86215)

62009003
INFLUENZA VIRUS POPULATION DYNAMICS IN THE RESPIRATORY TRACT OF EXPERIMENTALLY INFECTED MICE
LARSON E W; DOMINIK J W; ROWBERG A H; HIGBEE G A
INFECT IMMUN 13 (2). 1976 438-447. Coden: INFIB
Descriptors: ORTHOMYXOVIRUS LUNG TRACHEA NASO PHARYNX RESPIRATORY CHALLENGE MATHEMATICAL PATHOGENESIS MODEL COMPARTMENTAL MODELING
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(*16006), ROUTES OF IMMUNIZ,INFECT,THERAP(22100), MICROBIOLOG APPARAT,METHS,MEDIA-(32000), VIROLOGY-GENL STUDS,METHS(33502), VIROLOGY-ANIMAL HOST VIRUSES(*33506), MED/CLIN MICROBIOL-GEN,METH,TECH(36001), MED/CLIN MICROBIOL-VIROLOGY(*36006)
Biosystematic Codes: ANIMAL VIRUSES(03200), MURIDAE(86375)

61028737
MODEL OF GAS TRANSPORT IN PERIODICALLY VENTILATED LUNGS
SHABEL'NIKOV V G
KOSM BIOL AVIAKOSM MED 9 (3). 1975 28-34. Coden: KBAMA
Descriptors: PULMONARY GAS EXCHANGE AIR VOLUME CONCENTRATION CARBON DI OXIDE SOLUBILITY DIFFERENTIAL EQUATIONS MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), METABOLISM-ENERGY,RESPIRATION(*13003), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

76073430
HISTOGRAPHIC ANALYSIS OF LOWER AIRWAY STRUCTURE OF THE LUNG USING AUTOMATED IMAGE ANALYSIS
TYLER W S; HYDE D M; WIGGINS A D; HALLBERG D
ANAT HISTOL EMBRYOL 4 (4). 1975 (RECD 1976) 373 Coden: AHEMA
Descriptors: ABSTRACT MATHEMATICAL MODEL AUTOMATED IMAGE ANALYSIS DATA PROCESSING
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(*00530), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-ANATOMY(*16002)
Biosystematic Codes: MAMMALIA-UNSPECIFIED AND EXTINCT(85700)

76036800
HYPOXEMIA DURING CARBON DI OXIDE SUPPLEMENTATION AT HIGH ALTITUDE
HEINEKEN F G; FILLEY G F; REEVES J T; GROVER R F; MAHER J T; CRUZ J C; DENNISTON J C; CYMERMAN A
FED PROC 35 (3). 1976 477 Coden: FEPRA
Descriptors: ABSTRACT HUMAN LUNG DIFFUSING CAPACITY MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), EXTERN EFF-PRESSURE(*10606), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(*15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

60057977
EFFECT OF SHAPE AND SIZE OF LUNG AND CHEST WALL ON STRESSES IN THE LUNG
VAWTER D L; MATTHEWS F L; WEST J B
J APPL PHYSIOL 39 (1). 1975 9-17. Coden: JAPYA
Descriptors: DOG MECHANICAL STRESS SURFACE PRESSURE MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL STUDIES(*10502), BIOPHYS-BIOCYBERNETICS(*10515), EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), CHORDATE BODY REGNS-THORAX(*11312), PHYSIOLOGY-STRESS(*12008), RESPIRATORY SYST-ANATOMY(*16002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: CANIDAE(85765)

60053110
ESTIMATION OF CARDIAC OUTPUT BY ANALYSIS OF RESPIRATORY GAS EXCHANGE
HOMER L D; DENYSYK B
J APPL PHYSIOL 39 (1). 1975 159-165. Coden: JAPYA
Descriptors: DOG HUMAN THERMAL DILUTION LUNG MODEL MATHEMATICAL MODEL MASS SPECTROMETER HEMORRHAGIC SHOCK
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(10012), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), CARDIOVASC SYST-GENL STUDS,METHS(*14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), CARDIOVASC SYST-BLD VESS PATHOL(*14508), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(*15002), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), TEMPERATURE-GENL,METHS(*23001)
Biosystematic Codes: CANIDAE(85765), HOMINIDAE(86215)

60046171
LYAPUNOV RE DESIGN OF MODEL REFFRENCE ADAPTIVE CONTROL SYSTEM FOR LONG-TERM VENTILATION OF LUNG
WOO J; ROOTENBERG J
ISA (INSTRUM SOC AM) TRANS 14 (1). 1975 89-98. Coden: ISATA
Descriptors: HUMAN MATHEMATICAL MODEL COMPUTER
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(*00530), MATHEMATIC BIOL/STATISTIC METH(*04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-THERAPY(12512), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

60028536
ELASTICITY PROPERTIES OF LUNG PARENCHYMA DERIVED FROM EXPERIMENTAL DISTORTION DATA
LEE G C; FRANKUS A
BIOPHYS J 15 (5). 1975 481-494 Coden: BIOJA
Descriptors: DOG MATHEMATICAL MODEL STRAIN ENERGY FUNCTION
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOPHYS-GENERAL STUDIES(*10502), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: CANIDAE(85765)

60022858
AN EQUATION OF GAS TRANSPORT IN THE LUNG
YU C P
RESPIR PHYSIOL 23 (2). 1975 257-266. Coden: RSPYA
Descriptors: DIFFUSION MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

60005383
SOME IMPLICATIONS OF TERNARY DIFFUSION IN THE LUNG
CHANG H-K; TAI R C; FARHI L E
RESPIR PHYSIOL 23 (1). 1975 109-120. Coden: RSPYA
Descriptors: HELIUM GAS TRANSPORT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(*10012), BIOPHYS GENERAL STUDIES(10502), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

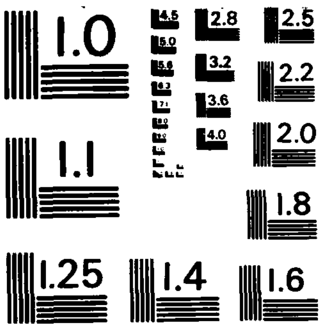
59040169
AN EFFICIENT OPTIMIZATION TECHNIQUE FOR RECOVERING VENTILATION PERFUSION DISTRIBUTIONS FROM INERT GAS DATA EFFECTS OF RANDOM EXPERIMENTAL ERROR
JALIWALA S A; MATES R E; KLOCKE F J
J CLIN INVEST 55 (1). 1975 188-192. Coden: JCINA
Descriptors: HYPOTHETICAL LUNGS MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(*10012), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)

59022821
ANALYSIS OF EFFECT OF THE SOLUBILITY ON GAS EXCHANGE IN NONHOMOGENEOUS LUNGS
COLBURN W E JR; EVANS J W; WEST J B
J APPL PHYSIOL 37 (4). 1974 547-551. Coden: JAPYA
Descriptors: MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), CARDIOVASC SYST-GENL STUDS,METHS(14501), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(*15002), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)

59011180
STRUCTURAL ANALYSIS OF MATHEMATICAL MODEL OF GAS EXCHANGE PROCESS IN THE LUNGS/
MISYURA A H
FIZIOL ZH (KIEV) 20 (1). 1974 108-113. Coden: FZUKA
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(*10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(*10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)

AD-A139 670 TEST PLANNING COLLECTION AND ANALYSIS OF PRESSURE DATA RESULTING FROM WEAPON SYSTEMS(U) JAYCOR SAN DIEGO CA J H STUHMILLER ET AL. OCT 81 JAYCOR-J520-81-007 4/4

UNCLASSIFIED DAMD17-80-C-0104 F/G 19/6 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

59011146
FACTORS IN IMPEDANCE PNEUMOGRAPHY
ALBISSER A M; CARMICHAEL A B
MED BIOL ENG 12 (5). 1974 599-605. Coden: MBENA
Descriptors: HUMAN MATHEMATICAL MODEL LUNG RESISTANCE APNEA RESPIRATORY RATES
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(*-10515), CHORDATE BODY REGNS-THORAX(11312), PHYSIOLOGY-INSTRUMENTATION(*12004), MOVEMENT(12100), PATHOLOGY-DIAGNOSTIC(*1250-4), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(*160-06)
Biosystematic Codes: HOMINIDAE(86215)

75098364
CORRECTING BOHR ESTIMATES OF STEADY-STATE DIFFUSING CAPACITY FOR BREATHING PATTERN
KINDIG N B; HAZLETT D R
BARNETT, R. D. (ED.). BIOMEDICAL SCIENCES INSTRUMENTATION, VOL. 10. PROCEEDING OF THE ELEVENTH ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM AND THE ELEVENTH INTERNATIONAL ISA (INSTRUMENT SOCIETY OF AMERICA) BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM. COLORADO SPRINGS, COLO., U.S.A. APRIL 15-17, 1974. 181P. ILLUS. INSTRUMENT SOCIETY OF AMERICA: PITTSBURGH, PA., U.S.A. 1974 (RECD 1975) 85-88 Coden: 04421
Descriptors: HUMAN CARBON MON OXIDE MATHEMATICAL LUNG MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(*10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(*10515), PHYSIOLOGY-METHODS(*12006), MOVEMENT(1-2100), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004)
Biosystematic Codes: HOMINIDAE(86215)

75098355
LYAPUNOV REDESIGN OF MODEL REFERENCE ADAPTIVE CONTROL SYSTEM FOR LONG-TERM VENTILATION OF THE LUNG
WOO J; ROOTENBERG J
BARNETT, R. D. (ED.). BIOMEDICAL SCIENCES INSTRUMENTATION, VOL. 10. PROCEEDING OF THE ELEVENTH ANNUAL ROCKY MOUNTAIN BIOENGINEERING SYMPOSIUM AND THE ELEVENTH INTERNATIONAL ISA (INSTRUMENT SOCIETY OF AMERICA) BIOMEDICAL SCIENCES INSTRUMENTATION SYMPOSIUM. COLORADO SPRINGS, COLO., U.S.A. APRIL 15-17, 1974. 181P. ILLUS. INSTRUMENT SOCIETY OF AMERICA: PITTSBURGH, PA., U.S.A. 1974 (RECD 1975) 33-42 Coden: 04421
Descriptors: HUMAN ALVEOLAR PRESSURE AUTOMATIC CONTROL SYSTEM MATHEMATICAL MODEL COMPUTER
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(*00530), MATHEMATIC BIOL/STATISTIC METH(*04500), BIOPHYS-BIOCYBERNETICS(*10515), PATHOLOGY-DIAGNOSTIC(12504), PATHOLOGY-THERAPY(*12-512), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

75091985
CHANGE OF THE FUNCTIONAL DEAD SPACE IN THE LUNGS
VOROB'EVA Z V
TER ARKH 47 (3). 1975 50-55 Coden: TEARA
Descriptors: HUMAN GAS ABSORPTION MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), BIOCHEM-GASES(*10012), BIOPHYS-BIOCYBERNETICS(10515), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(16006)
Biosystematic Codes: HOMINIDAE(86215)

75074113
ON THE THEORY OF LUNG DEPOSITION OF VERY SMALL WATER SULFURIC-ACID AEROSOLS
STAUFFER D
HEALTH PHYS 26 (4). 1974 365-366 Coden: HLTPA
Descriptors: LETTER HUMAN AIR POLLUTANT MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(*04500), ECOLOGY-BIOCLIMATOL,BIOMETEOROL(07504), BIOCHEM STUD-GENERAL(10060), RESPIRATORY SYST-PATHOLOGY(*16006), TOXICOL-ENVIRONMNTL,INDUSTR(*22506), ENVIRON HEALTH-AIR,WATR,SL POLLN(*37015)
Biosystematic Codes: HOMINIDAE(86215)

58005461
MATHEMATICAL MODELING OF PULMONARY AIRWAY DYNAMICS
GOLDEN J F; CLARK J W JR; STEVENS P M
IEEE (INST ELECTR ELECTRON ENG) TRANS BIOMED ENG 20 (6). 1973 397-404. Coden: IEBEA
Descriptors: HUMAN OBSTRUCTIVE LUNG DISEASE AIRWAY RESISTANCE LUNG ELASTIC RECOIL AIRWAY COLLAPSE PANTING
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(*-10515), MOVEMENT(12100), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(*16004), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

57022868
THE DIAGNOSTIC VALUE OF SINGLE BREATH CARBON MON OXIDE DIFFUSION COEFFICIENT IN CHRONIC AIRWAYS OBSTRUCTION
HARRIS L
BULL PHYSIO-PATHOL RESPIR 9 (2). 1973 473-480. Coden: BPPRA
Descriptors: HUMAN BRONCHITIS DIFFUSING CAPACITY ALVEOLAR VOLUME TOTAL LUNG CAPACITY DIAGNOSIS MATHEMATICAL MODEL
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM GASES(+10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(+10515), PATHOLOGY-DIAGNOSTIC(+12504), PATHOLOGY-INFLAMMATN,INFLAM DIS(12508), METABOLISM-GENL STUD,METAB PATHW(+13002), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(+15002), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(16004), RESPIRATORY SYST-PATHOLOGY(+16006), GERONTOLOGY(24500)
Biosystematic Codes: HOMINIDAE(86215)

57017060
POSSIBILITY OF DETERMINING THE VENTILATED VOLUME OF THE LUNGS BY MATHEMATICAL MODELING/
KIRYUKHIN A B; KANAEV N N
FIZIOL ZH SSSR IM I M SECHENOVA 58 (5). 1972 788-792. Coden: FZLZA
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(+04500), BIOCHEM-GASES(10012), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-MEMBRANE PHENOMENA(10508), MOVEMENT(12100), METABOLISM-ENERGY,RESPIRATION(13003), CARDIOVASC SYST-PHYSIOL,BIOCHEM(+14504), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

74067393
APPLICATION OF THE MATHEMATICAL MODEL OF BAYES IN THE DIFFERENTIAL DIAGNOSIS OF SOLITARY PULMONARY LESIONS
PIETRASZKIEWICZ L
POZNAN TOW PRZYJ NAUK WYDZ LEK PR KOM MED DOSW 45. 1973 (RECD 1974) 203-232 Coden: PTPMA
Descriptors: HUMAN HAMARTOMA TUBERCULOSIS BRONCHIAL CARCINOMA LUNG ABSCESS CHRONIC PNEUMONIA LUNG INFARCTION COMPUTER
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(+00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), RADIATION BIOL-RADTN,ISOTOP TECH(+06504), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-RADIOLOGIC(11106), PATHOLOGY-COMPARATIVE(+12503), PATHOLOGY-DIAGNOSTIC(+12504), PATHOLOGY-INFLAMMATN,INFLAM DIS(12508), CARDIOVASC SYST-BLD VESS PATHOL(14508), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(+16006), NEOPLSMS/NEOPL AGNTS-DIAGNS METH(+24001), MED/CLIN MICROBIOL-BACTERIOLOGY(36002)
Biosystematic Codes: ACTINOMYCETALES(06200), HOMINIDAE(86215)

74053674
THE APPLICATION OF PARAMETER ESTIMATION TECHNIQUES TO THE MEASUREMENT OF PULMONARY BLOOD FLOW AND LUNG VOLUME THE USE OF SELF ADAPTIVE MODELS IN THE ANALYSIS OF PULMONARY WASHOUT CURVES
PACK A I; FERGUSON D; MILLS R J; MORAN F; MURRAY-SMITH D J
BULL PHYSIO-PATHOL RESPIR 9 (5). 1973 1297-1299 Coden: BPPRA
Descriptors: ABSTRACT HUMAN CHRONIC BRONCHITIS CARBON DIOXIDE TENSION MATHEMATICAL MODEL COMPUTER MASS SPECTROMETRY PNEUMO TACHOGRAPHY
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(+00530), PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM-GASES(+10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-BIOCYBERNETICS(+10515), ANATOMY/HISTOL-RADIOLOGIC(11106), MOVEMENT(12100), PATHOLOGY-INFLAMMATN,INFLAM DIS(12508), CARDIOVASC SYST-PHYSIOL,BIOCHEM(+14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(+15002), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: HOMINIDAE(86215)

74036127
FAILURE OF NITROGEN WASHOUT TO DISTINGUISH PARALLEL FROM SERIES INEQUALITY OF VENTILATION
NYE R E JR
FED PROC 33 (3 PART 1). 1974 421 Coden: FEPRA
Descriptors: ABSTRACT LUNG MATHEMATICAL MODEL COMPUTER
Concept Codes: GENL BIOL-INFRMTN,DOCU,COMP APPL(+00530), MATHEMATIC BIOL/STATISTIC METH(04500), BIOCHEM GASES(+10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-BIOCYBERNETICS(+10515), PATHOLOGY-DIAGNOSTIC(12504), RESPIRATORY SYST-GENL STUD,METHS(+16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(+16004), RESPIRATORY SYST-PATHOLOGY(+16006)
Biosystematic Codes: VERTEBRATA-UNSPECIFIED(85150)

74035774
THE EFFECT OF AIR FLOW SHAPE ON GAS EXCHANGE ACROSS THE LUNG
DAMOKOSH-GIORDANO A; CHERNIACK N S; LONGOBARDO G S; BAAN J
FED PROC 33 (3 PART 1). 1974 353 Coden: FEPRA
Descriptors: ABSTRACT MATHEMATICAL MODEL VENOUS TISSUE ARTERIAL BLOOD
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), BIOCHEM-GASES(•10012), BIOCHEM STUD-GENERAL(10060), BIOPHYS-MEMBRANE PHENOMENA(•10508), BIOPHYS-BIOCYBERNETICS(•10515), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004)

74018003
GROWTH RATES CELL KINETICS AND MATHEMATICAL MODELS OF HUMAN CANCERS
SOMMERS S C
IOACHIM, HARRY L. (ED.). PATHOBIOLOGY ANNUAL, VOL. 3. VIII+509P. ILLUS. APPLETON-CENTURY-CROFTS: NEW YORK, N.Y., USA 1973 309-340 Coden: 03480
Descriptors: SARCOMA TESTICULAR BREAST CERVICAL COLON RECTAL LUNG SKIN LIP CANCERS LYMPHO SARCOMA RETICULUM CELL SARCOMA TERATOMA
Concept Codes: CYTOLOGY/CYTOCHEM-HUMAN(02508), MATHEMATIC BIOL/STATISTIC METH(04500), DIGESTIVE SYST-PATHOLOGY(•14006), BLOOD/BODY FLDS-BLD,LYM,RES PATH(•15006), BLOOD/BODY FLDS-LYMPHAT TISS,RES(15008), RESPIRATORY SYST-PATHOLOGY(•16006), REPRODUCT SYST-PATHOLOGY(•16506), ENDOCRINE SYST-GONADS,-PLACENTA(•17006), BONE,JNTS,FASC,CONN/ADIP-PATHOL(•18006), INTEGUMENT SYST-PATHOLOGY(•18506), DENTAL/ORAL BIOL-PATHOLOGY-(•19006), NEOPLSMS/NEOPL AGNTS-PATH,CLINIC(•24004), NEOPLSMS/-NEOPL AGNTS-BLOOD,RES(•24010), DEVELOPMNTL BIOL-DESCRIP TERATOL(•25552)
Biosystematic Codes: HOMINIDAE(86215)

74009135
INDEXES OF LUNG ELASTICITY AND MATHEMATICAL MODEL .
FRIEMEL F; CANNET G; LAFOSSE J E; JACQUEMIN C
EUR J CLIN INVEST 3 (3). 1973 228-229 Coden: EJCIB
Descriptors: ABSTRACT HUMAN PLETHYSMOGRAPHY
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(•10515), EXTERN EFF-PRESSURE(•10606), PHYSIOLOGY-INSTRUMENTATION(12004), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), RESPIRATORY SYST-PATHOLOGY(16006)
Biosystematic Codes: HOMINIDAE(86215)

74004598
A SIMPLE METHOD TO DETERMINE THE MEAN SPECIFIC VENTILATION AND VARIANCE
MOHLER J; BUTLER J; HACKNEY J
PHYSIOLOGIST 16 (3). 1973 398 Coden: PYSOA
Descriptors: ABSTRACT LUNG MATHEMATICAL MODEL NORMAL HUMAN OBSTRUCTIVE LUNG DISEASE ACQUIRED HEART DISEASE
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(•04500), BIOPHYS-BIOCYBERNETICS(•10515), CARDIOVASC SYST HEART PATHOLOGY(•14506), RESPIRATORY SYST-GENL STUD,METHS(•16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), RESPIRATORY SYST-PATHOLOGY(•16006)
Biosystematic Codes: HOMINIDAE(86215)

74004363
TRANSDUCTION FUNCTION OF PULMONARY STRETCH RECEPTORS
CASABURI R
PHYSIOLOGIST 16 (3). 1973 280 Coden: PYSOA
Descriptors: ABSTRACT CAT LUNG VOLUME MATHEMATICAL MODEL BRONCHI SMOOTH MUSCLE RESPIRATORY CENTER
Concept Codes: MATHEMATIC BIOL/STATISTIC METH(04500), BIOPHYS-BIOCYBERNETICS(10515), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PHYSIOL,BIOCHEM(•16004), MUSCLE SYST-PHYSIOL,BIOCHEM(•17504), SENSE ORGANS-PHYSIOL,BIOCHEM(•20004), NERVOUS SYST-PHYSIOL,BIOCHEM(•20504)
Biosystematic Codes: FELIDAE(85770)

18061465
BLAST INJURIES TO THE EAR A HISTORICAL AND LITERARY REVIEW
PAHOR A L
DEP. OTORHINOLARYNGOL., DUDLEY RD. HOSP., P.O. BOX 293, BIRMINGHAM B18 7OH, ENGL., UK.
J LARYNGOL OTOL 93 (3). 1979. 225-252. Coden: JLOTA
Language: ENGLISH
Descriptors: HUMAN DEAFNESS NOISE
Concept Codes: GENL BIOL-HISTORY,ARCHAEOLOGY(00522), EXTERN EFF-SONICS,ULTRASONICS(•10608), PATHOLOGY-GENERAL STUDIES(12502), SENSE ORGANS-PATHOLOGY(•20006), SENSE ORGANS-DEAFNSS,SPEECH,HEAR(•20008), ENVIRON HEALTH-MISCELL STUDS(•37019)
Biosystematic Codes: HOMINIDAE(86215)

68039599
SUBDURAL HEMATOMA IN AN ADULT FOLLOWING A BLAST INJURY CASE REPORT
MURTHY J M K; CHOPRA J S; GULATI D R
DEP. NEUROL., POSTGRAD. INST. MED. EDUC. RES., CHANDIGARH-160012, PUNJAB AND HARYANA, INDIA.
J NEUROSURG 50 (2). 1979. 260-261. Coden: JONSA
Language: ENGLISH
Descriptors: HUMAN PIPE FITTER OCCUPATIONAL HAZARD
Concept Codes: EXTERN EFF-PHYSICAL,MECH EFFECTS(•10612), CARDIOVASC SYST-BLD VESS PATHOL(•14508), NERVOUS SYST-PATHOLOGY(•20506), ENVIRON HEALTH-OCCUPATNL HEALTH(•37013)
Biosystematic Codes: HOMINIDAE(86215)

68030367
BLAST INJURY WITH PARTICULAR REFERENCE TO RECENT TERRORIST BOMBING INCIDENTS
HILL J F
SQUIBB EUR. LTD., TWICKENHAM, MIDDX., ENGL., UK.
ANN R COLL SURG ENGL 61 (1). 1979. 4-11. Coden: ARCSA
Language: ENGLISH
Descriptors: HUMAN NORTHERN IRELAND LUNG PATHOLOGY FRACTURE BURN EYE INJURY EAR INJURY
Concept Codes: SOCIAL BIOL/HUMAN ECOLOGY(05500), EXTERN EFF-PHYSICAL,MECH EFFECTS(•10612), CHORDATE BODY REGNS-HEAD(11304), CHORDATE BODY REGNS-FACIAL(11306), CHORDATE BODY REGNS-NECK(11308), PATHOLOGY-GENERAL STUDIES(•12502), PATHOLOGY-THERAPY(12512), RESPIRATORY SYST-PATHOLOGY(•16006), BONE,JNTS,FASC,CONN/ADIP-PATHOL(•18006), SENSE ORGANS-PATHOLOGY(•20006), TEMPERATURE-THERMOPATHOLOGY(•23007), PUB HEALTH-ADMINISTR,STATISTICS(37010), EPIDEMIOL-MISCELL STUDIES(•37056)
Biosystematic Codes: HOMINIDAE(86215)

16031950

SPECULAR MICROSCOPIC FINDINGS IN TRAUMATIC POSTERIOR ANNULAR KERATOPATHY
MALONEY W F; COLVARD D M; BOURNE W M
INVEST OPHTHALMOL VISUAL SCI (SUPPL). 1978 118 119
Coden: IOVSD
Descriptors: ABSTRACT HUMAN BLAST INJURY
Concept Codes: PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), MICROSCOPY-GENL,SPECL TECHNIQUES(01052), CYTOLOGY/CYTOCHEM HUMAN(02508), BIOPHYS-GENERAL BIOPHYS TECH(10504), EXTERN EFF-PHYSICAL,MECH EFFECTS(10612), PATHOLOGY-DIAGNOSTIC(12504), SENSE ORGANS-GENL STUDS,METHS(20001), SENSE ORGANS-PATHOLOGY(•20006)
Biosystematic Codes: HOMINIDAE(86215)

63009418
GOLD TRACER STUDIES OF MUSCLE REGENERATION
YAROM R; BEHAR A J; YANKO L; HALL T A; PETERS P D
J NEUROPATHOL EXP NEUROL 35 (4). 1976 445-457. Coden: JNENA
Descriptors: RABBIT INTERSTITIAL CELL MYO BLAST COLD INJURY
Concept Codes: CYTOLOGY/CYTOCHEM-ANIMAL(02506), MINERALS(10069), BIOPHYS-MEMBRANE PHENOMENA(10508), EXTERN EFF COLD(10616), EXTERN EFF-HOT(10618), ANATOMY/HISTOL-REGEN,TRANSPLANT(•11107), ANATOMY/HISTOL-MICRO,ULTRAMICRSC(•11108), MINERALS(•13010), BLOOD/BODY FLDS-BLOOD CELL STUDS(15004), BLOOD,BODY FLDS-LYMPHAT TISS,RES(15008), MUSCLE SYST-GENL STUDS,METHS(17501), MUSCLE SYST-PHYSIOL,BIOCHEM(•17504), MUSCLE SYST-PATHOLOGY(•17506), SENSE ORGANS-PATHOLOGY(•20006), TOXICOL-GENL/EXP STUDS,METHS(•22501), TEMPERATURE-GENL,METHS(23001), TEMPERATURE-CRYOBIOLOGY(23004)
Biosystematic Codes: LEPORIDAE(86040)

77043490
LEAPERS LUNG RESPIRATORY SEQUELAE OF MASSIVE BLUNT CHEST TRAUMA
ROBERTSON T; HUDSON L D; LAKSHMINARAYAN S
CHEST 70 (3). 1976 439-440 Coden: CHETB
Descriptors: ABSTRACT HUMAN RESEMBLES LUNG BLAST INJURY BRIDGE JUMP
Concept Codes: BEHAVIOR BIOL-HUMAN BEHAVIOR(07004), EXTERN EFF-PHYSICAL,MECH EFFECTS(•10612), PATHOLOGY-COMPARATIVE(•12503), RESPIRATORY SYST-PATHOLOGY(•16006), PSYCHIATRY-PSYCHOPATH-DYNM,THERAP(21002)
Biosystematic Codes: HOMINIDAE(86215)

77009321
BLAST INJURIES TO THE LUNGS CLINICAL PRESENTATION MANAGEMENT AND COURSE
CASEBY N G; PORTER M F
INJURY 8 (1). 1976 1-12 Coden: INJUB
Descriptors: HUMAN ARTERIAL HYPOXEMIA RADIOLOGICAL CHANGES CONTINUOUS POSITIVE PRESSURE VENTILATION
Concept Codes: PHOTOGRAPHY-METHS,MATLS,APPARAT(01012), RADIATION BIOL-RADTN,ISOTOP TECH(06504), BIOCHEM-GASES(*10012), EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), ANATOMY/HISTOL-RADIOLOGIC(*11106), PATHOLOGY-THERAPY(12512), CARDIOVASC SYST-PHYSIOL,BIOCHEM(*14504), BLOOD/BODY FLDS-BLOOD,LYMPH STUD(*15002), RESPIRATORY SYST-GENL STUD,METHS(*16001), RESPIRATORY SYST-PATHOLOGY(*16006)
Biosystematic Codes: HOMINIDAE(86215)

76085465
RECENT DEVELOPMENTS IN BIO MECHANICS MANAGEMENT AND MITIGATION OF HEAD INJURIES
GURDJIAN E S
CHASE, THOMAS N. (ED.). THE NERVOUS SYSTEM, VOL. 2. THE CLINICAL NEUROSCIENCES. XIV+542P. ILLUS. RAVEN PRESS PUBLISHERS: NEW YORK, N.Y., U.S.A. ISBN 0-89004-076-1. 1975 (RECD 1976) 407-420 Coden: 05148
Descriptors: HUMAN TORSION PENETRATING INJURIES ELECTRICAL INJURIES BLAST INJURIES PREVENTIVE TECHNIQUES
Concept Codes: BIOPHYS-GENERAL STUDIES(*10502), EXTERN EFF-GENL STUD(10602), EXTERN EFF-PRESSURE(*10606), EXTERN EFF-ELECTR,MAGNET,GRAVITY(*10610), EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), CHORDATE BODY REGNS-HEAD(11304), PHYSIOLOGY--STRESS(*12008), PATHOLOGY-THERAPY(*12512), NERVOUS SYST-GENL STUDS,METHS(*20501), NERVOUS SYST-PATHOLOGY(*20506)
Biosystematic Codes: HOMINIDAE(86215)

75061445
THORACIC INJURIES IN THE YOM-KIPPUR WAR EXPERIENCE IN A BASE HOSPITAL
LEVINSKY L; VIDNE B; NUDELMAN I; SALOMON J; KISSIN L; LEVY M J
ISR J MED SCI 11 (2/3). 1975 275-280 Coden: IJMDA
Descriptors: HUMAN LUNG HEART CHEST WALL BLAST INJURY BLUNT TRAUMA BULLET WOUNDS SHRAPNEL FRAGMENTS HEMORRHAGE THORACOTOMY
Concept Codes: EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), ANATOMY/HISTOL-SURGERY(11105), CHORDATE BODY REGNS-THORAX(*11312), PATHOLOGY-GENERAL STUDIES(*12502), PATHOLOGY-NECROSIS(12510), PATHOLOGY-THERAPY(*12512), DIGESTIVE SYST-PATHOLOGY(14006), CARDIOVASC SYST-HEART PATHOLOGY(14506), CARDIOVASC SYST-BLD VESS PATHOL(14508), BLOOD/BODY FLDS-LYMPHAT TISS,RES(15008), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(16006), BONE,JNTS,FASC,CONN/ADIP-PATHOL(18006), NERVOUS SYST-PATHOLOGY(20506), PUB HEALTH-HEALTH SERV,MEDL CARE(37012)
Biosystematic Codes: HOMINIDAE(86215)

75061444
BLAST INJURY OF THE CHEST A REVIEW OF THE PROBLEM AND ITS TREATMENT
WEILER-RAVELL D; ADATTO R; BORMAN J B
ISR J MED SCI 11 (2/3). 1975 268-274 Coden: IJMDA
Descriptors: HUMAN UNDER WATER EXPLOSION NERVOUS SYSTEM HEART INSUFFICIENCY RESPIRATORY INSUFFICIENCY
Concept Codes: AEROSP/UNDRWATR BIOL-PHYSIOL,MED(*06006), BIOCHEM-GASES(10012), BIOPHYS-GENERAL BIOPHYS TECH(10504), BIOPHYS-MEMBRANE PHENOMENA(10508), BIOPHYS-BIOENGINEERING(10511), EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), CHORDATE BODY REGNS-THORAX(*11312), MOVEMENT(12100), PATHOLOGY-GENERAL STUDIES(*12502), PATHOLOGY-DIAGNOSTIC(12504), PATHOLOGY-THERAPY(*12512), CARDIOVASC SYST-HEART PATHOLOGY(14506), CARDIOVASC SYST-BLD VESS PATHOL(14508), RESPIRATORY SYST-GENL STUD,METHS(16001), RESPIRATORY SYST-PATHOLOGY(16006), NERVOUS SYST-PATHOLOGY(20506)
Biosystematic Codes: HOMINIDAE(86215)

75056842
MINE BLAST INJURIES AND THEIR MANAGEMENT IN FORWARD AREAS
ROY CHOWDHURY T K
ARMED FORCES MED J INDIA (SPEC ISSUE). 1974 167-172
Coden: AFMIB
Descriptors: HUMAN TRAUMATIC AMPUTATION EYE INJURY FOOT LEG PENETRATING CHEST INJURY POISONOUS SMOKE SURGERY
Concept Codes: BIOCHEM STUD-GENERAL(10060), EXTERN EFF-PHYSICAL,MECH EFFECTS(*10612), ANATOMY/HISTOL SURGERY(*11105), CHORDATE BODY REGNS-THORAX(11312), CHORDATE BODY REGNS-PELVIS(11316), CHORDATE BODY REGNS-EXTREMITIES(11318), PATHOLOGY-GENERAL STUDIES(*12502), PATHOLOGY-NECROSIS(12510), PATHOLOGY-THERAPY(*12512), CARDIOVASC SYST-HEART PATHOLOGY(14506), RESPIRATORY SYST-PATHOLOGY(16006), BONE,JNTS,FASC,CONN/ADIP-PATHOL(*18006), SENSE ORGANS-PATHOLOGY(20006), TOXICOL-GENL/EXP STUDS,METHS(*22501), ENVIRON HEALTH OCCUPATNL HEALTH(37013)
Biosystematic Codes: HOMINIDAE(86215)

78A22759 ISSUE 11 PAGE 2022 CATEGORY 51
78/03/00 4 PAGES UNCLASSIFIED DOCUMENT
UTTL: Blood gas tension and development of lung damage in mice exposed to oxygen at 1 ATA
AUTH: A/SCHAEFER, G.; B/CITOLER, P. PAA: A/(Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Institut fuer Flugmedizin, Bad Godesberg, West Germany); B/(Koeln, Universitaet, Cologne, West Germany)
Aviation, Space, and Environmental Medicine, vol. 49, Mar. 1978, p. 476-479.
MAJS: /*BLOOD/*CARBON DIOXIDE TENSION/*HYPEROXIA/*OXYGEN TENSION/*PULMONARY LESIONS
MINS: / AMINO ACIDS/ CENTRAL NERVOUS SYSTEM/ EDEMA/ LUNG MORPHOLOGY/ MICE/ PULMONARY FUNCTIONS

78A20030 ISSUE 11 PAGE 2021 CATEGORY 51 CNT#: NIH-HL-17603 NIH-1-P01-HL-07896-13 78/03/00 6 PAGES UNCLASSIFIED DOCUMENT
UTTL: Tolerance and cross-tolerance using NO2 and O2. I - Toxicology and biochemistry
AUTH: A/CRAPO, J. D.; B/SJOSTROM, K.; C/DREW, R. T. PAA: C/(Duke University, Durham; National Institute of Environmental Health Sciences, Research Triangle Park, N.C.)
Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology, vol. 44, Mar. 1978, p. 364-369.
MAJS: /*ADAPTATION/*ENZYME ACTIVITY/*HYPEROXIA/*NITROGEN DIOXIDE/*TOLERANCES (PHYSIOLOGY)
MINS: / BIOASSAY/ INORGANIC PEROXIDES/ METABOLISM/ OXIDIZERS / PULMONARY LESIONS/ RATS
ABA: S.D.
ABS: Male rats (300-350 g) are tested for pulmonary tolerance and cross-tolerance to the potent oxidant gases O2 and NO2. A comparison of some of the biochemical changes occurring after exposure to tolerance-inducing doses of these two oxidant agents is presented. Biochemical mechanisms of O2 and NO2 toxicity are described. Exposures to 85% O2 appear to lead to more pulmonary damage than does exposure to 25 ppm NO2. The time courses for the development of tolerance to O2 and NO2 are found to be significantly different. It is shown that exposing rats to 85% O2 continuously for five days results in the development of tolerance to 100% O2, and that these same animals become partially cross-tolerant to exposures to 75 ppm NO2. Rats initially exposed to 25 ppm NO2 for 6 hr/day on each of five successive days exhibit tolerance to 75 ppm NO2 but no significant cross-tolerance to 100% O2 exposures.

78A20558 ISSUE 6 PAGE 1029 CATEGORY 51
76/03/00 3 PAGES In FRENCH UNCLASSIFIED DOCUMENT
UTTL: Influence of radioactivity or sulfur treatment on hyperoxia-induced pulmonary lesions in the rat
AUTH: A/VIEILLEFOND, H.; B/NOGUES, C.; C/GRANDPIERRE, R. PAA: A/(Centre d'Essais en Vol, Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge, Essonne, France); B/(Centre de Recherches de Medecine Aeronautique, Paris, France)
Revue de Medecine Aeronautique et Spatiale, vol. 15, 1st Quarter, 1976, p. 29-31. In French.
MAJS: /*HYPEROXIA/*PULMONARY LESIONS/*RADIATION DOSAGE/*SULFUR
MINS: / ALVEOLAR AIR/ ARTERIES/ HISTAMINES/ HISTOLOGY/ PARTIAL PRESSURE/ RADIOACTIVITY/ RATS/ THIOLS
ABA: S.D.
ABS: Homogeneous groups of female rats (average weight 130 g) with pulmonary lesions caused by hyperoxia were subjected to radioactivity treatment and sulfurized-water treatment, respectively, in order to verify the hypothesis that sulfur limits damage at the pulmonary lesion sites, while ionizing radiation aggravates such damage. The results show clearly the combination of deleterious effects of hyperoxia associated with radioactivity, but do not completely demonstrate protection by exposure to thiol radicals. Protection apparently occurs only when sulfur treatment precedes hyperoxia; it is virtually nonexistent when sulfur treatment is associated with exposure to radioactivity.

77A34069# ISSUE 15 PAGE 2555 CATEGORY 52
76/12/00 23 PAGES In ITALIAN UNCLASSIFIED DOCUMENT
UTTL: A case of spontaneous pneumothorax caused by rapid decompression at actual or simulated altitude
AUTH: A/ROTONDO, G. PAA: A/(Aeronautica Militare, Servizio di Sanita, Rome, Italy)
(INFCA, Congresso Internazionale su Recenti Acquisizioni in Biometeorologia ed Applicazioni Pratiche del Clima di Altitudine Naturale e Simulata, Ancona, Italy, Sept. 5-9, 1976.) Rivista di Medicina Aeronautica e Spaziale, vol. 39, July-Dec. 1976, p. 295-317. In Italian.
MAJS: /*AEROSPACE MEDICINE/*ALTITUDE SIMULATION/*PNEUMOTHORAX/*PRESSURE REDUCTION
MINS: / AIRCRAFT PILOTS/ COCKPITS/ HIGH ALTITUDE/ PATHOGENESIS/ PULMONARY LESIONS/ RADIOGRAPHY
ABA: R.D.V.
ABS: The article reports and analyzes a spontaneous pneumothorax case provoked by failure of the aircraft pressurization system with rapid cockpit depressurization. The etiopathogenesis is analyzed by

examining conditions occurring in pressurized aircraft in high-altitude flight and analyzing simulated flight conditions in a depression chamber. In response to mechanical failure or damage to sealing components. Preventive measures, including rigorous personnel selection measures, are weighed; preconditioning in decompression tests and high-altitude flight is recommended. Criteria for prompt aeromedical evacuation are presented.

76A33383 ISSUE 15 PAGE 2355 CATEGORY 51
76/05/00 6 PAGES UNCLASSIFIED DOCUMENT
UTTL: Mechanism of lung damage in explosive decompression
AUTH: A/TCHLIFF, E. D. L. PAA: A/(Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada)
Aviation, Space, and Environmental Medicine, vol. 47, May 1976, p. 517-522.
MAJS: /*EXPLOSIVE DECOMPRESSION/*PULMONARY LESIONS/*RESPIRATORY SYSTEM/*TRACHEA
MINS: / MICE/ MORTALITY/ PRESSURE EFFECTS/ SHOCK FRONTS
ABA: C.K.D.
ABS: It has been shown that closure of the trachea does not reduce mortality in mice subjected to maximally rapid decompression, suggesting that under this condition the lungs and thorax may be treated as a closed system. Boyle's Law is invoked in the derivation of a formula for the transthoracic pressure generated during decompression. The mortality resulting from maximally rapid decompression is directly related to the transthoracic pressure. In slow decompression the transthoracic pressure gradient is degraded by lung expansion and by pressure equalization via the trachea. It is suggested that the maximally rapid decompression following a shock front may be responsible for pulmonary blast injuries.

76A18553# ISSUE 6 PAGE 829 CATEGORY 52
75/12/00 7 PAGES In UKRAINIAN UNCLASSIFIED DOCUMENT
UTTL: On estimation of external respiration function efficiency under extensive affections of lung tissue and hypoxia in people
AUTH: A/LAUER, N. V.; B/GOROVENKO, G. G.; C/ZHUKOVSKII, L. I.; D/DMITRENKO, S. M. PAA: D/(Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii; Kiivs'kii Institut Tuberkul'ozu i Grudnoi Khirurgii, Kiev, Ukrainian SSR)
Fiziologichnii Zhurnal, vol. 21, Nov.-Dec. 1975, p. 800-806. In Ukrainian.
MAJS: /*HUMAN PATHOLOGY/*HYPOXIA/*LUNG MORPHOLOGY/*RESPIRATORY PHYSIOLOGY
MINS: / ALVEOLAR AIR/ GAS EXCHANGE/ PHYSIOLOGICAL TESTS/ TISSUES (BIOLOGY)/ TUBERCULOSIS
ABA: (Author)
ABS: General and alveolar ventilation and gas exchange were studied in 50 patients with extensive fibrous-cavernous lung tuberculosis, 15 persons with healthy lungs and 15 healthy people under the same conditions by means of an automatic alveolar cutter and a specially designed device. The multilateral studies were performed with regard to satisfaction of metabolic requirements of the organism at rest and under a short-term effect of hypoxic loading (inhalation of gas mixture containing 15.3 of O2 in nitrogen). It is established that with extensive structural damages of the lung tissue a decrease in respiration efficiency and economy at rest are the leading point in the external respiration function changes. Application of hypoxic loading showed its significance for testing the reserve potentialities of the external respiration function in patients with extensive affections of the lungs.

76A13578 ISSUE 3 PAGE 368 CATEGORY 51 CNT#: N00014-70-C-0306 NIH-HL-15098 NIH-71-2151 75/11/00
3 PAGES UNCLASSIFIED DOCUMENT
UTTL: Effects of 100% oxygen on cell division in lung alveoli of squirrel monkeys
AUTH: A/HACKNEY, J. D.; B/EVANS, M. J.; C/SPIER, C. E. PAA: C/(Rancho Los Amigos Hospital, Downey; Stanford Research Institute, Menlo Park, Calif.)
Aviation, Space, and Environmental Medicine, vol. 46, Nov. 1975, p. 1340-1342.
MAJS: /*ALVEOLAR AIR/*CELL DIVISION/*HYPEROXIA/*LUNG MORPHOLOGY
MINS: / AUTORADIOGRAPHY/ DEOXYRIBONUCLEIC ACID/ MONKEYS/ OXYGEN CONSUMPTION/ PULMONARY CIRCULATION/ TISSUES (BIOLOGY)
ABA: (Author)
ABS: The paper evaluates the effects of 100% oxygen on cell division in lung alveoli of squirrel monkeys. Squirrel monkeys were exposed to 100% oxygen for up to 5 days. Prior to sacrifice, cells preparing to divide were labeled with tritiated thymidine. Labeled cells were visualized with autoradiographic techniques, counted with the light microscope, and expressed in terms of a labeling index. It was shown that DNA synthesis was initially inhibited by exposure to 100% oxygen. However, within 3 days it was returning to normal and by 5 days was well above control levels. Analysis of the cell types involved showed that the large increase in labeling was due to an increase in dividing type-2 cells, which is thought to be for replacement of damaged type-1 cells.

74A40280 ISSUE 20 PAGE 2814 CATEGORY 5
74/08/00 3 PAGES UNCLASSIFIED DOCUMENT
UTTL: Deaths from burns in Army aircraft, 1965-1971
AUTH: A/BRAUNOHLER, W. M.; B/MCMEEKIN, R. R. PAA: A/(U.S. Army, Aeromedical Research Laboratory, Fort Rucker, Ala.); B/(Armed Forces Institute of Pathology, Washington, D.C.)
(Joint Committee on Aviation Pathology, Scientific Session, 8th, Colorado Springs, Colo., Oct. 8-11, 1972.) Aerospace Medicine, vol. 45, Aug. 1974, Section 2, p. 939-941.
MAJS: /*AUTOPSIES/*BURNS (INJURIES)/*FLIGHT CREWS/*MILITARY AIRCRAFT/*RESPIRATORY IMPEDANCE
MINS: / AIRCRAFT ACCIDENT INVESTIGATION/ CRASH INJURIES/ DEATH/ HUMAN PATHOLOGY/ POSTFLIGHT ANALYSIS/ PULMONARY FUNCTIONS/ UH-1 HELICOPTER
ABA: (Author)
ABS: A review of the autopsy reports of burned Army aircrew-members received by the Armed Forces Institute of Pathology during the period 1965 through 1971 revealed that most delayed deaths were from respiratory complications. Contributing factors leading to death in each case were recorded. The introduction of crashworthy fuel systems in UH-1 rotary-wing aircraft and fire-resistant outerwear garments has greatly reduced the incidence of injury to aircrewmembers from burns. The reduction of injury caused by fire will remain a perplexing problem, however. Implications of the study were that damage to the lungs by toxic gases may predispose the victim to fatal pulmonary complications. Treatment is difficult, but prevention may solve the problem.

74A30636 ISSUE 14 PAGE 1919 CATEGORY 4 RPT#: AD-779244 CNT#: N00014-66-A-0499 NR PROJECT 101-753 74/05/00 4 PAGES UNCLASSIFIED DOCUMENT
UTTL: Effect of adrenergic drugs on pulmonary responses to high-pressure oxygen
AUTH: A/HAMMOND, R. E.; B/AKERS, T. K. PAA: B/(North Dakota, University, Grand Forks, N. Dak.)
Aerospace Medicine, vol. 45, May 1974, p. 525-528.
Research supported by the University of North Dakota;
MAJS: /*CATECHOLAMINES/*EDEMA/*HYPEROXIA/*LUNGS/*PHARMACOLOGY/*PULMONARY FUNCTIONS
MINS: / CATECHOLAMINE/ CHEMORECEPTORS/ CHEMOTHERAPY/ HEMODYNAMIC RESPONSES/ HIGH PRESSURE OXYGEN/ PROPHYLAXIS/ RESERPINE/ SYMPATHETIC NERVOUS SYSTEM
ABA: (Author)
ABS: Adult, male Sprague-Dawley rats were divided into groups of 10 and pretreated daily for 3 days with drugs known to alter adrenergic function. Half the animals were exposed to OHP (5 ATA O2-13 ATA He) for 30 min. The rest were exposed to a mixture of 20% O2-80% He at 1 ATA for 30 min. Total lung water contents were compared following experimental exposure. Groups pretreated with phentolamine, reserpine, and a combination of phentolamine, propranolol, reserpine, imipramine, and tyramine had significantly less lung water than controls following OHP exposure. It is concluded that alpha-adrenergic blockade and peripheral catecholamine depletion have protective value in preventing pulmonary damage during OHP exposure.

74A19042 ISSUE 6 PAGE 752 CATEGORY 4 CNT#: N00014-70-A-0357-0002 NIH-NS-07797 74/01/00 4 PAGES UNCLASSIFIED DOCUMENT
UTTL: Effect of disulfiram on oxygen toxicity in beagle dogs
AUTH: A/FAIMAN, M. D.; B/NOLAN, R. J.; C/OEHME, F. W. PAA: C/(Kansas, University, Lawrence, Kan.)
Aerospace Medicine, vol. 45, Jan. 1974, p. 29-32.
MAJS: /*DISULFIDES/*HIGH PRESSURE OXYGEN/*HYPEROXIA/*PHARMACOLOGY/*TOXICITY
MINS: / CONVULSIONS/ DOGS/ ETHYL COMPOUNDS/ LUNG MORPHOLOGY/ PRESSURE EFFECTS
ABA: (Author)
ABS: The protection of beagle dogs with disulfiram from high oxygen pressure convulsions and lung damage was investigated. Disulfiram was administered in a dose of 200 mg/kg ip. to both male and female beagle dogs, and the dogs exposed to 4 atmospheres of 100% oxygen. Dogs not previously treated with disulfiram convulsed within 10 min, whereas disulfiram-treated beagle dogs experienced no convulsions or other signs of oxygen toxicity. Also, no oxygen-induced lung damage, such as atelectasis, edema or hemorrhage, was found in disulfiram-treated animals. Disulfiram appears to be an excellent agent for use as a protectant against oxygen toxicity in beagle dogs.

73A28507 ISSUE 13 PAGE 1576 CATEGORY 4 RPT#: AD-759298 CNT#: N00014-70-A-0159-0001 73/04/00 3 PAGES UNCLASSIFIED DOCUMENT
UTTL: Hyperbaric oxygen and alveolar surfactants.
UNOC: Cat and rat lung damage due to hyperbaric oxygen exposure and head injury, discussing alveolar surfactants, sympathetic stimulation and monkey injuries
AUTH: A/BECKMAN, D. L.; B/HOULIHAN, R. T. PAA: A/(Wayne State University, Detroit, Mich.); B/(Michigan State University, East Lansing, Mich.)
Aerospace Medicine, vol. 44, Apr. 1973, p. 422-424.
MAJS: /*ALVEOLI/*HEAD (ANATOMY)/*HIGH PRESSURE OXYGEN/*HYPERBARIC CHAMBERS/*PULMONARY LESIONS
MINS: / BODY WEIGHT/ CATS/ ELECTRIC STIMULI/ HYPEROXIA/

INTERFACIAL TENSION/ RATS/ SYMPATHETIC NERVOUS SYSTEM
ABA: (Author)
ABS: Gross lung damage was previously found in rats exposed to mechanical head injury similar to that which occurs during exposure of rats to oxygen at high pressure (OHP). The pulmonary effects from this CNS injury and OHP exposure were blocked by sympatholytic and antiepinephrine agents. In monkeys CNS injury altered the alveolar surfactants in the absence of any immediate gross lung damage. Surfactant changes were also produced by electrical stimulation of the pulmonary sympathetics in monkeys and cats. The present experiments were performed in order to determine whether OHP also could alter the alveolar surfactants before the occurrence of any gross lung damage. The results indicate that while rats exposed to minimal OHP have both altered surfactants and gross lung damage, that cats had altered surfactants without the attendant gross lung damage; lung weight/body weight ratios were normal in the cat.

72A34544# ISSUE 17 PAGE 2508 CATEGORY 5 RPT#: [illegible] 72/00/00 7 PAGES
UNCLASSIFIED DOCUMENT
UTTL: Effects of nitrogen and helium upon pulmonary damage after rapid decompression to 2 torr.
AUTH: A/COOKE, J. P. PAA: A/(USAF, School of Aerospace Medicine, Brooks AFB, Tex.)
Aerospace Medicine, vol. 43, June 1972, p. 599-605.
MAJS: /*DECOMPRESSION SICKNESS/*NITROGEN/*PHYSIOLOGICAL EFFECTS/*PULMONARY LESIONS/*RARE GASES/*RESPIRATION
MINS: / DOGS/ GAS MIXTURES/ HELIUM/ HEMATOLOGY/ HEMORRHAGES/ SURVIVAL

71A20681 ISSUE 8 PAGE 1237 CATEGORY 4 71/02/00
7 PAGES UNCLASSIFIED DOCUMENT
UTTL: Etiological studies of pulmonary oxygen poisoning
UNOC: Generalized hyperoxia and local effects of oxygen on lungs in etiology of pulmonary damage due to oxygen, noting nitrogen and carbon monoxide effects
AUTH: A/MACINTYRE, J.; B/NORMAN, J. N.; C/ROSS, R. R.; D/SMITH, G. PAN: (AD/ABERDEEN, U., ABERDEEN, SCOTLAND/.)
AMERICAN JOURNAL OF PHYSIOLOGY, VOL. 220, P. 492-498.
MAJS: /*HYPEROXIA/*PULMONARY LESIONS
MINS: / CARBON MONOXIDE/ ETIOLOGY/ MICE/ NITROGEN/ OXYGEN BREATHING/ RATS

71A20328 ISSUE 7 PAGE 1052 CATEGORY 5 71/02/00
3 PAGES UNCLASSIFIED DOCUMENT
UTTL: Serum protein determination during short exhaustive physical activity
UNOC: Bicycle ergometer workout effects on serum proteins, noting intravascular redistribution, tissue damage and membrane permeability
AUTH: A/POORTMANS, J. R. PAN: (AA/BRUXELLES, UNIVERSITE LIBRE, BRUSSELS, BELGIUM/.)
JOURNAL OF APPLIED PHYSIOLOGY, VOL. 30, P. 190-192. RESEARCH SUPPORTED BY THE MINISTERE DE L'EDUCATION NATIONALE.
MAJS: /*PHYSICAL WORK/*PHYSIOLOGICAL RESPONSES/*PROTEIN METABOLISM/*SERUMS
MINS: / ERGOMETERS/ FATIGUE (BIOLOGY)/ HEMATOCRIT RATIO/ INTRAVASCULAR SYSTEM/ LUNGS/ MEMBRANE STRUCTURES/ PERMEABILITY/ SKIN (ANATOMY)/ TISSUES (BIOLOGY)/ TREADMILLS

71A15054 ISSUE 4 PAGE 538 CATEGORY 4 70/12/00
5 PAGES UNCLASSIFIED DOCUMENT
UTTL: Synergistic oxygen-inert gas interactions in laboratory rats in a hyperbaric environment
UNOC: Oxygen-nitrogen synergistic interactions in rats in hyperbaric environment, determining lung damage by total water measurement
AUTH: A/AKERS, T. K.; B/NIELSEN, T. W.; C/THOMPSON, R. E. PAN: (AA/NORTH DAKOTA, U., GRAND FORKS, N. DAK./.)
AEROSPACE MEDICINE, VOL. 41, P. 1388-1392.
MAJS: /*GAS-GAS INTERACTIONS/*HYPERBARIC CHAMBERS/*LUNG MORPHOLOGY
MINS: / GAS MIXTURES/ GAS PRESSURE/ MOISTURE CONTENT/ RATS

70A27659 ISSUE 12 PAGE 2170 CATEGORY 4 CNT#: N00014-68-C-376 70/04/00 8 PAGES UNCLASSIFIED DOCUMENT
UTTL: Protection by altitude acclimatization against lung damage from exposure to oxygen at 825 mm Hg
UNOC: Altitude acclimatization protection against lung damage from exposure to oxygen at high partial pressures experimented on rats
AUTH: A/BRAUER, R. W.; B/PARRISH, D. E.; C/PESSOTTI, R. L.; D/PRATT, P. C.; E/WAY, R. O. PAN: (AC/WRIGHTSVILLE MARINE BIO-MEDICAL LAB., WILMINGTON, DUKE U., DURHAM, N.C., U.S. NAVAL MATERIAL COMMAND, NAVAL RADIOLOGICAL DEFENSE LAB., SAN FRANCISCO, CALIF./.)
JOURNAL OF APPLIED PHYSIOLOGY, VOL. 28, P. 474-481.
MAJS: /*ALTITUDE ACCLIMATIZATION/*HIGH PRESSURE OXYGEN/*HYPEROXIA/*PULMONARY LESIONS/*RATS
MINS: / HYPOXIA/ LUNGS/ OXYGEN BREATHING/ PATHOLOGICAL EFFECTS/ PRESSURE EFFECTS

69A29299 ISSUE 14 PAGE 2407 CATEGORY 4 CNT#: PHS T01-GM-1273-03 NONR-969/03/ PHS-HE-06848-05 PHS-T01-TM-1273-03 69/05/00 5 PAGES UNCLASSIFIED DOCUMENT
UTTL: Histochemical studies in pulmonary oxygen toxicity.
UNCC: Pulmonary oxygen toxicity, analyzing reticulin and elastic tissue damage and hyaline membranes by histochemical techniques
AUTH: A/GUPTA, R. K.; B/LANPHIER, E. H.; C/WINTER, P. M.
PAN: (AB/NEW YORK, STATE U., SCHOOL OF MEDICINE, VETERANS ADMINISTRATION HOSPITAL, BUFFALO, N.Y./.) AEROSPACE MEDICINE, VOL. 40, P. 500-504.
MAJS: /*HISTOLOGY/*HYPEROXIA/*OXYGEN TENSION/*PULMONARY FUNCTIONS/*TISSUES (BIOLOGY)
MINS: / ALVEOLI/ ARTERIES/ DOGS/ MEMBRANES

79N32601# ISSUE 24 PAGE 3256 CATEGORY 54 79/10/00 PAGES UNCLASSIFIED DOCUMENT
UTTL: Significance of the vibration component to the deleterious effect of impact accelerations
AUTH: A/MIROLYUBOV, G. P.; B/ELIVANOV, V. A.; C/STUPAKOV, G. P.
CORP: Joint Publications Research Service, Arlington, Va. AVAIL.NTIS SAP: HC A07/MF A01
In its Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) p 71-76 (SEE N79-33769 24-51) Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 51-54
MAJS: /*IMPACT ACCELERATION/*PHYSIOLOGICAL EFFECTS/* VIBRATION EFFECTS
MINS: / DAMAGE/ DAMPING/ DOGS/ HEART/ LESIONS/ LIVER/ LUNGS/ MECHANICAL SHOCK/ OSCILLATIONS
ABA: Author
ABS: Animal experiments demonstrated that damped oscillations of the support construction induced by impact accelerations enhanced their damaging effect on dogs. Within the frequency range tested (from 20 to 178 Hz) the threshold of lesions of the lungs, heart and liver decreased and reached 34% at a frequency of 85 Hz. The level of liver lesions was inversely proportional to the frequency of the support oscillations. Lesions of the lungs and the heart were more expressed at 85 Hz and decreased with an increase or a decrease of the oscillation frequency. At a frequency of 130-176 Hz the effect of the vibration component was not seen.

79N17931 ISSUE 9 PAGE 1088 CATEGORY 25 RPT#: BLL-RTS-11322 78/09/00 10 PAGES UNCLASSIFIED DOCUMENT DCAF F002907
UTTL: Chromic acid and its compounds
AUTH: A/NOMURA, S.
CORP: British Library Lending Div., Boston Spa (England). SAP: Avail: British Library Lending Div., Boston Spa, Engl.
Transl. into ENGLISH from Rodo Eisei (Japan), vol. 18, no. 10, 1977 p 22-25
MAJS: /*CHROMIC ACID/*CHROMIUM COMPOUNDS/*TOXICITY
MINS: / BIOLOGICAL EFFECTS/ CANCER/ DERMATITIS/ PUBLIC HEALTH
ABA: G.Y.
ABS: There is an increasing incidence of lung cancer in Japan's chromic acid plants, and environmental pollution due to chromium has become a matter of social concern. Environmental and operative health control has suddenly come to be reconsidered in every plant or organization that deals with chromium compounds. However, a prerequisite to establishing an effective worker health surveillance system and achieving results is to have a fall comprehension of chromium compounds and their action on the body. Types and toxicity of chromium compounds and damage to health resulting from chromic, dichromic acid, etc. and health surveillance are discussed.

77N21832# ISSUE 12 PAGE 1641 CATEGORY 52 RPT#: MBL-1976-14 TDCK-68717 76/00/00 19 PAGES In DUTCH UNCLASSIFIED DOCUMENT DCAF E002629
UTTL: Toxic properties of CN and CS --- alpha-chloroacetophenone and o-chlorobenzylidenemalononitrile
AUTH: A/ELSKAMP, D. M. W.
CORP: Medical Biological Lab. RVO-TNO, The Hague (Netherlands). AVAIL.NTIS SAP: HC A02/MF A01
MAJS: /*ACETYL COMPOUNDS/*BENZENE/*CHLORINE COMPOUNDS/* MALONONITRILE/*TOXICITY
MINS: / HUMAN TOLERANCES/ LETHALITY/ PHARMACOLOGY/ RESPIRATORY SYSTEM
ABA: ESA
ABS: Toxic properties of the lacrimating gases CN (alpha-chloroacetophenone) and CS (O-chlorobenzylidenemalonitrile) were compared. The pharmacology of CN and CS is discussed and toxic effects, resulting from animal tests and from chemical data, are dealt with. Toxicity data from animal tests are presented and these data are extrapolated to humans. It is concluded that the mechanism of action of CS is very well known, that of CN is not; there is no indication for carcinogenic action of both, CN acts embryotoxic, CS does not; both are sensitizing; 5

mortal cases are known for CN, for CS none; CS does not cause permanent damage to eyes, respiratory system or skin; CS has a lower effective dosage, a higher lethal dosage, and a larger safety margin than CN.

77N20755# ISSUE 11 PAGE 1497 CATEGORY 52 RPT#: AD-A030315 76/00/00 18 PAGES UNCLASSIFIED DOCUMENT

UTTL: Respiratory heat loss and pulmonary function during cold-gas breathing at high pressures TLSP: Medical Research Progress Report

AUTH: A/HOKE, B.; B/JACKSON, D. L.; C/ALEXANDER, J. M.; D/FLYNN, E. T.

CORP: Naval Medical Research Inst., Bethesda, Md. AVAIL.NTIS SAP: HC A02/MF A01 Proc. of Symp. on Underwater Physiol., Bethesda, Md., 1976

MAJS: /*COLD GAS/*HEAT MEASUREMENT/*OXYGEN BREATHING/* PULMONARY FUNCTIONS

MINS: / DIVING (UNDERWATER)/ HIGH PRESSURE/ HYPERBARIC CHAMBERS/ PHYSICAL EXERCISE

ABA: GRA

ABS: In deep diving, significant heat loss through the lungs--both in warming and in humidifying the inspired cold gas--occurs due to the increased thermal capacity of the breathing-gas mixture. Other factors which increase respiratory heat loss (RHL) are a decrease in inspired gas temperature (TI) and an increase in respiratory minute volume (VE). The purpose of this study was to measure RHL in two divers at rest and at four graded levels of exercise while breathing cold gas at simulated depths to 1,000 feet of sea water (fsw). A secondary purpose was to study cardiopulmonary function and to investigate the possibility of pulmonary damage from dense, cold gas acting directly on the respiratory tract mucosa.

76N20709# ISSUE 11 PAGE 1421 CATEGORY 45 RPT#: PB-245760/4 EPA-450/2-75-007 75/09/00 108 PAGES UNCLASSIFIED DOCUMENT

UTTL: Position paper on regulation of atmospheric sulfates TLSP: Final Report

CORP: Environmental Protection Agency, Research Triangle Park, N.C. CSS: (Office of Air Quality Planning and Standards.) AVAIL.NTIS SAP: HC $5.50

MAJS: /*AIR POLLUTION/*ATMOSPHERIC CHEMISTRY/*POLLUTION CONTROL/*SULFATES/ SULFUR DIOXIDES

MINS: / ATMOSPHERIC DIFFUSION/ ENVIRONMENT EFFECTS/ EPIDEMIOLOGY/ INDUSTRIAL WASTES/ PARTICLES/ PUBLIC HEALTH/ REGULATIONS/ RESPIRATORY SYSTEM

ABA: GRA

ABS: Toxicological evidence indicates that certain sulfates, particularly fine particulate acid sulfates, are more potent respiratory irritants than sulfur dioxide alone. Preliminary epidemiological studies suggest that measured sulfates are associated with various health indicators. Sulfates may also be related to damage to the environment by direct deposition or by formation of acid rain. Sulfates in industrialized regions are largely produced by atmospheric reactions of manmade sulfur oxides emissions. Sulfates may be transported long distances from source areas and result in high ambient levels over broad regions. Considerations of chemistry and transport suggest that reductions in regional SO2 emissions would produce reduction in sulfates, although the reductions would be less than one to one. Information concerning sulfates is presented and research and development needs are identified. The implications of the information presented for present and long-term regulatory control of sulfur oxides is also discussed and a policy for sulfates is evaluated.

74N27561# ISSUE 17 PAGE 1998 CATEGORY 4 RPT#: AD-777290 AFOSR-73-2335TR CNT#: AF-AFOSR-2383-72 AF PROJ. 9777 73/08/31 49 PAGES UNCLASSIFIED DOCUMENT

UTTL: Physiological adjustments to environmental factors

AUTH: A/ROSTORFER, H. H.

CORP: Indiana Univ., Bloomington CSS: (Dept. of Anatomy and Physiology.) AVAIL.NTIS

MAJS: /*ENVIRONMENTAL INDEX/*PHYSIOLOGICAL TESTS/*STRESS (PHYSIOLOGY)

MINS: / BLOOD FLOW/ BODY TEMPERATURE/ HUMAN BODY/ MATHEMATICAL MODELS/ MONKEYS/ PRIMATES

ABA: GRA

ABS: The report summarizes investigations in the following areas--temperature regulation in primates, mathematical modeling of pulmonary compliance and resistance, regulation of blood glucose in man during exercise, and microvascular blood flow dynamics in skeletal muscle. Data gathered during the period indicate that physiological control of evaporative heat loss due to sweating in the resting rhesus monkey is similar to that found in resting man. Experimental evidence to date indicates the rhesus can serve as an adequate thermoregulatory model for experiments which cannot be performed on man. A least squares parameter identification has been used to assess nonlinear aspects of the mechanical properties of isolated lung and to study the affects of chronic elevated carbon dioxide for two months was insufficient to induce pulmonary damage suggesting that either higher concentration or longer exposure times are needed to

induce significant changes. (Modified author abstract)

74N18752*# ISSUE 10 PAGE 1130 CATEGORY 4 RPT#: NASA-TT-F-15317 CNT#: NASW-2485 74/03/00 23 PAGES UNCLASSIFIED DOCUMENT

UTTL: Effect of shock waves --- pathogenetic effect of air blast on the human body

AUTH: A/DUBENIN, P. I.

CORP: Techtran Corp., Glen Burnie, Md. AVAIL.NTIS SAP: HC $4.25
Washington NASA Transl. into ENGLISH from the publ. ""Patologicheskaya Fiziologiya Ekstremalnykh Sostoyaniy'' Moscow, Med., 1973 p 312-322

MAJS: /*AERIAL EXPLOSIONS/*HUMAN PATHOLOGY/*INJURIES/*SHOCK WAVES

MINS: / BLAST LOADS/ BRAIN/ HEART/ LUNGS

ABA: Author

ABS: Studies of the pathogenetic effects of shock waves from explosions are reviewed. The characteristics of an air blast are described. The interaction of such a blast on the human body, and the mechanism of resulting damage are investigated with particular attention being devoted to the role of air blast parameters in injuries, and to the characteristics of pathogenesis for direct injuries. The problems associated with protection against and treatment of air blast injury are examined.

73N20119*# ISSUE 11 PAGE 1246 CATEGORY 4 RPT#: NASA-TT-F-14828 CNT#: NASW-2481 73/02/00 8 PAGES UNCLASSIFIED DOCUMENT

UTTL: Resistance of animals immersed in water to high acceleration

UNOC: Resistance of animals immersed in water to high acceleration

AUTH: A/MARGARIA, R.; B/GUALTIEROTTI, T.; C/SPINELLI, D.

CORP: Kanner (Leo) Associates, Redwood City, Calif. AVAIL.NTIS SAP: HC $3.00
Washington NASA Transl. into ENGLISH from Atti Accad. Naz. Lincei, Classe Sci. Fis. Mat. Nat. (Rome), v. 22, no. 6, 1957 p 703-706

MAJS: /*ACCELERATION TOLERANCE/*ANIMALS/*WATER

MINS: / CENTRIFUGES/ FISHES/ FROGS/ HIGH ACCELERATION/ OTOLITH ORGANS/ RATS

ABA: Author

ABS: The nullification of the forces of acceleration by immersion in water were tested experimentally. Fish and frogs were subjected to acceleration in a centrifuge in a column of water of varying depth. Rats were placed in a steel tank and allowed to fall to the floor. Under the conditions of the experiment, fishes and frogs manifested permanent damage to the otolitic system as well as temporary damage such as ischemia and hyperemia. Rats, while not exhibiting otolitic changes, succumbed to hemorrhagic pulmonary lesions due to a difference in specific weight between the lung tissue and the rest of the body. The height of the column of water above the animal is an important factor since resistance to acceleration diminishes as the depth of water increases. An animal immersed in water can withstand acceleration ten times greater than when it is in air.

73N15163# ISSUE 6 PAGE 635 CATEGORY 5 RPT#: DLR-FB-71-96 71/08/00 67 PAGES In GERMAN; ENGLISH summary UNCLASSIFIED DOCUMENT

UTTL: Oxygen therapy. Observations on the behavior of enzyme activities in plasma after breathing oxygen at high pressure

UNOC: Behavior of enzyme activities in blood plasma after breathing hyperbaric oxygen

AUTH: A/PAULMANN, H.

CORP: Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). CSS: (Inst. fuer Flugmedizin.) AVAIL.NTIS SAP: HC $5.50; DFVLR, Porz, West Ger. 17.60 DM

MAJS: /*BLOOD PLASMA/*ENZYMES/*HYPERBARIC CHAMBERS/*OXYGEN BREATHING

MINS: / ACTIVATION (BIOLOGY)/ BIBLIOGRAPHIES/ PULMONARY FUNCTIONS/ STRESS (PHYSIOLOGY)/ THERAPY

ABA: Author (ESRO)

ABS: The behavior of enzyme activities in blood plasma was examined to extablish the pulmonary cellular damage of young men exposed to oxygen at high pressure. A correlation was found between the extent of the stress reaction and the stress intensity. Pulmonary damage caused by oxygen poisoning could not be determined by the enzyme diagnosis.

72N21054# ISSUE 12 PAGE 1560 CATEGORY 4 RPT#: AD-734208 DNA-2738T CNT#: DASA01-70-C-0075 71/07/01 135 PAGES UNCLASSIFIED DOCUMENT

UTTL: The biodynamics of airblast

UNOC: Effects of exposure to blast induced winds and pressure variations on biophysical parameters

AUTH: A/WHITE, C. S.; B/JONES, R. K.; C/DAMON, E. K.; D/FLETCHER, E. R.; E/RICHMOND, D. R.

CORP: Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. AVAIL.NTIS
Presented at the Symp. on Linear Acceleration of the Impact Type, Porto, Portugal, 23-26 Jun. 1971

MAJS: /*AERIAL EXPLOSIONS/*BIODYNAMICS/*BLAST LOADS/*IMPACT LOADS/*PRESSURE DISTRIBUTION/*STRESS (PHYSIOLOGY)

MINS: / ACCELERATION TOLERANCE/ CARDIOVASCULAR SYSTEM/ HEMORRHAGES/ KIDNEYS/ PHYSIOLOGY/ RESPIRATORY SYSTEM
ABA: Author (GRA)
ABS: After pointing out that accelerative and decelerative events are associated with the direct (pressure) and indirect (translational events including penetrating and nonpenetrating debris and whole-body impact) effects of exposure to blast-induced winds and pressure variations, some of the relevant biophysical parameters were selectively noted and discussed. These included the pressure-time relationship: species differences: ambient pressure effects; the significance of positional (orientational) and geometric (situational) factors as they influence the wave form, the pressure dose and the biologic response; and data bearing upon the etiology of blast injury. The consequences of pressure-induced violent implosion of the body wall and the significance of the associated variations in the internal gas and fluid pressures were described and emphasized as were alternating phases of :forced: hemorrhage and arterial air embolization, fibrin thrombi, coagulation anomalies and renal, cardiac, and pulmonary sequelae. Tentative biomedical criteria consistent with recent interspecies scaling and modeling studies for assessing primary blast hazards were presented.

72N19134# ISSUE 10 PAGE 1299 CATEGORY 5
71/06/26 21 PAGES UNCLASSIFIED DOCUMENT
UTTL: The biodynamics of air blast
UNOC: Biodynamics of air blast during accelerative and decelerative events
AUTH: A/WHITE, C. S.; B/JONES, R. K.; C/DAMON, E. G.; D/FLETCHER, E. R.; E/RICHMOND, D. R.
CORP: Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. AVAIL.NTIS SAP: HC $6.00/MF $0.95
In AGARD Linear Acceleration of Impact Type 21 p (SEE N72-19119 10-05) Sponsored by DASA and AEC
MAJS: /*ACCELERATION (PHYSICS)/*BIODYNAMICS/*BLAST LOADS/*DECELERATION
MINS: / AIR FLOW/ CONFERENCES
ABA: Author
ABS: After pointing out that accelerative and decelerative events are associated with the direct and indirect effects of exposure to blast-induced winds and pressure variations, some of the relevant biophysical parameters were selectively noted and discussed. These included the pressure-time relationship; species differences; ambient pressure effects; the significance of positional (orientational) and geometric (situational) factors as they influence the wave form, the pressure dose and the biologic response; and data bearing upon the etiology of blast injury. The consequences of pressure-induced violent implosion of the body wall and the significance of the associated variations in the internal gas and fluid pressures were described and emphasized, as were alternating phases of forced hemorrhage and arterial air embolization, fibrin thrombi, coagulation anomalies, and renal, cardiac and pulmonary sequelae. Tentative biomedical criteria consistent with recent interspecies scaling and modeling studies for assessing primary blast hazards were presented.

69N13969*# ISSUE 4 PAGE 609 CATEGORY 5 RPT#: NASA-CR-1223 CNT#: NASR-115 68/11/00 129 PAGES
UNCLASSIFIED DOCUMENT
UTTL: Rapid /explosive/ decompression emergencies in pressure-suited subjects
UNOC: Biomechanical factors determining lung damage following explosive decompression of space suits in vacuum test chambers
AUTH: A/ROTH, E. M.
CORP: Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. AVAIL.NTIS WASHINGTON
MAJS: /*EXPLOSIVE DECOMPRESSION/*INJURIES/*LUNGS/*SPACE SUITS/*VACUUM CHAMBERS
MINS: / AEROEMBOLISM/ BIODYNAMICS/ CLOSURES/ FAIL-SAFE SYSTEMS/ GAS COMPOSITION/ GLOTTIS/ OXYGEN/ PATHOLOGICAL EFFECTS/ RUPTURING

APPENDIX B

CITATIONS FROM LITERATURE SEARCH II

LITERATURE SEARCH - II

LUNG INJURY DUE TO BLAST EFFECT

DATA BASE		NUMBER OF CITATIONS
MEDLINE		158
NTIS		12
	TOTAL	170

● Denotes articles being looked at.

1 AU - ROSE DK ; FROESE AB
TI - THE REGULATION OF PACO2 DURING CONTROLLED VENTILATION OF CHILDREN WITH A T-PIECE.
MH - ADOLESCENCE ; CARBON DIOXIDE/BIOSYNTHESIS/*BLOOD ; CHILD
MH - CHILD, PRESCHOOL ; FEMALE ; HUMAN ; INFANT ; MALE
MH - MODELS, THEORETICAL ; PARTIAL PRESSURE ; PULMONARY ALVEOLI
MH - *RESPIRATORS ; RESPIRATORY DEAD SPACE ; TIDAL VOLUME
LA - ENG
SO - CAN ANAESTH SOC J 1979 MAR;26(2):104-13

2 AU - RAMSDEN D
TI - DIRECT COMPARISONS OF HUMAN AND ANIMAL DATA FOR PLUTONIUM OXIDE INHALATION.
MH - ANIMAL ; BONE AND BONES/RADIATION EFFECTS ; COMPARATIVE STUDY
MH - ENVIRONMENTAL EXPOSURE ; HUMAN ; LIVER/RADIATION EFFECTS
MH - LUNG/*RADIATION EFFECTS ; MODELS, THEORETICAL
MH - PLUTONIUM/*ADMINISTRATION & DOSAGE ; RADIATION DOSAGE
LA - ENG
SO - HEALTH PHYS 1979 JAN;36(1):88-9

3 AU - HILL JF
TI - BLAST INJURY WITH PARTICULAR REFERENCE TO RECENT TERRORIST BOMBING INCIDENTS.
AB - THE AETIOLOGY OF PRIMARY BLAST LUNG IS DISCUSSED WITH REFERENCE TO THE BIODYNAMICS OF BLAST INJURY, AND THE CLINICAL AND PATHOLOGICAL FEATURES OF THE CONDITION ARE DESCRIBED. AN ANALYSIS OF CASUALTIES FROM BOMB BLAST INCIDENTS OCCURRING IN NORTHERN IRELAND LEADS TO THE FOLLOWING CONCLUSIONS CONCERNING THE INJURIES FOUND IN PERSONS EXPOSED TO EXPLOSIONS: (1) THERE IS A PREDOMINANCE OF HEAD AND NECK TRAUMA, INCLUDING FRACTURES, LACERATIONS, BURNS, AND EYE AND EAR INJURIES; (2) FRACTURES AND TRAUMATIC AMPUTATIONS ARE COMMON AND OFTEN MULTIPLE; (3) PENETRATING TRUNK WOUNDS CARRY A GRAVE PROGNOSIS; AND (4) PRIMARY BLAST LUNG IS RARE. A COMPARISON OF FOUR BOMBING INCIDENTS IN ENGLAND IN 1973 AND 1974 SHOWS HOW THE TYPE AND SEVERITY OF INJURY ARE RELATED TO THE PLACE IN WHICH THE EXPLOSION OCCURS. THE ADMINISTRATIVE AND CLINICAL ASPECTS OF THE MANAGEMENT OF CASUALTIES RESULTING FROM TERRORIST BOMBING ACTIVITIES ARE DISCUSSED.
MH - BLAST INJURIES/*ETIOLOGY/MORTALITY/OCCURRENCE/THERAPY ; ENGLAND
MH - HEAD INJURIES/ETIOLOGY ; HEMORRHAGE/ETIOLOGY
MH - HOSPITAL ADMINISTRATION ; HUMAN ; LUNG DISEASES/ETIOLOGY
MH - LUNG/*INJURIES/PATHOLOGY ; NORTHERN IRELAND ; PRESSURE ; REVIEW
LA - ENG
SO - ANN R COLL SURG ENGL 1979 JAN;61(1):4-11

4 AU - ROBINSON JS
TI - RESPIRATORY CARE AFTER INJURY.
MH - BLAST INJURIES/THERAPY ; HUMAN ; LUNG/INJURIES
MH - RESPIRATION, ARTIFICIAL/INSTRUMENTATION/*METHODS
MH - RESPIRATORY DISTRESS SYNDROME, ADULT/THERAPY
MH - THORACIC INJURIES/THERAPY ; WOUNDS AND INJURIES/*THERAPY
LA - ENG
SO - INJURY 1978 AUG;10(1):46-8

5 AU - PORSTENDORFER J ; WICKE A ; SCHRAUB A
TI - THE INFLUENCE OF EXHALATION, VENTILATION AND DEPOSITION PROCESSES UPON THE CONCENTRATION OF RADON (222RN), THORON (220RN) AND THEIR DECAY PRODUCTS IN ROOM AIR.
MH - *AIR POLLUTION, RADIOACTIVE ; CONSTRUCTION MATERIALS
MH - ENVIRONMENTAL EXPOSURE ; HUMAN ; LUNG/RADIATION EFFECTS
MH - MODELS, THEORETICAL ; *RADON ; RESPIRATION/RADIATION EFFECTS
MH - VENTILATION
LA - ENG
SO - HEALTH PHYS 1978 MAY;34(5):465-73

6 AU - SHAW DT ; RAJENDRAN N ; LIAO NS
TI - THEORETICAL MODELING OF FINE-PARTICLE DEPOSITION IN 3-DIMENSIONAL BRONCHIAL BIFURCATIONS.
AB - A THEORETICAL MODEL IS DEVELOPED FOR THE PREDICTION OF THE PEAK TO AVERAGE PARTICLE DEPOSITION FLUX IN THE HUMAN BRONCHIAL AIRWAYS. THE MODEL INVOLVES THE DETERMINATION OF THE PEAK FLUX BY A ROUND-NOSE 2-DIMENSIONAL BIFURCATION CHANNEL AND THE AVERAGE DEPOSITION FLUX BY A CURVED-TUBE MODEL. THE "HOT-SPOT" EFFECT FOR ALL GENERATIONS IN THE HUMAN RESPIRATORY SYSTEM IS ESTIMATED. IT IS FOUND THAT THE PEAK DEPOSITION FLUX IS HIGHER THAN THE AVERAGE DEPOSITION FLUX BY A FACTOR RANGING BETWEEN 5 AND 30, DEPENDING ON THE GENERATION NUMBER. THE IMPORTANCE OF THIS PEAK TO AVERAGE DEPOSITION FLUX RATIO ON CONSIDERATION OF ENVIRONMENTAL SAFETY STUDIES IS DISCUSSED.
MH - *AIR POLLUTANTS ; *BRONCHI ; DIFFUSION ; HUMAN
MH - *MODELS, THEORETICAL ; UNITED STATES GOV'T SUPPORTED
LA - ENG
SO - AM IND HYG ASSOC J 1978 MAR;39(3):195-201

7 AU - FULLERTON GD ; SEWCHAND W ; PAYNE JT ; LEVITT SH
TI - CT DETERMINATION OF PARAMETERS FOR INHOMOGENEITY CORRECTIONS IN RADIATION THERAPY OF THE ESOPHAGUS.
AB - ACCURATE DOSE PREDICTION FOR MEGAVOLTAGE PHOTON THERAPY OF CARCINOMA OF THE ESOPHAGUS REQUIRES INFORMATION ON TUMOR DEPTH, LUNG THICKNESS, AND LUNG DENSITY. THE AUTHORS FOUND THAT CT LOCALIZATION OF INTERNAL AND EXTERNAL CONTOURS IS ACCURATE WITHIN +/- 1 MM. LUNG DENSITY CAN BE MEASURED WITH AN ERROR OF LESS THAN 0.02 G/CM3 IN THE RANGE 0.25-1.00 G/CM3. VARIANCE BETWEEN PREDICTED AND MEASURED DOSAGE WAS LESS THAN 3% IN ALL PATIENTS AND IN MOST RANDO PHANTOM MEASUREMENTS. ACCURATE RADIATION THERAPY PLANNING IS POSSIBLE WITH CT INFORMATION FROM A COMMERCIAL SCANNER.

MH - COMPUTERS ; ESOPHAGEAL NEOPLASMS/*RADIOTHERAPY
MH - ESOPHAGUS/RADIOGRAPHY ; HUMAN ; LUNG/RADIOGRAPHY
MH - MODELS, THEORETICAL ; RADIOTHERAPY DOSAGE
MH - *TOMOGRAPHY, X-RAY COMPUTED
MH - UNITED STATES GOV'T SUPPORTED, P.H.S.
LA - ENG
SO - RADIOLOGY 1978 JAN;126(1):167-71

* * * * E N D O F O F F L I N E P R I N T * * * * *

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1 AU - RICHARDSON JW
TI - PHYSICAL AND CHEMICAL INJURIES TO THE LUNG. PP. 246-54.
MH - ATMOSPHERIC PRESSURE ; BLAST INJURIES/*COMPLICATIONS
MH - DECOMPRESSION SICKNESS/*COMPLICATIONS ; DROWNING
MH - GAS POISONING/*COMPLICATIONS ; HUMAN ; LUNG/*INJURIES ; MONOGRAPH
LA - ENG
SO - IN: WILLIAMS WG, SMITH RE, ED. TRAUMA OF THE CHEST. BRISTOL, WRIGHT, 1977. W3 C0444 1977T. ::

2 AU - JENSEN PH ; PETERSEN EL ; THYKIER-NIELSEN S ; VINTHER FH
TI - CALCULATION OF THE INDIVIDUAL AND POPULATION DOSES ON DANISH TERRITORY RESULTING FROM HYPOTHETICAL CORE-MELT ACCIDENTS AT THE BARSEB ACK REACTOR.
AB - INDIVIDUAL AND POPULATION DOSES ON DANISH TERRITORY ARE CALCULATED FROM HYPOTHETICAL, SEVERE CORE-MELT ACCIDENTS AT THE SWEDISH NUCLEAR PLANT AT BARSEB ACK. THE RELEASE FRACTIONS FOR THESE ACCIDENTS ARE TAKEN FROM WASH-1400. BASED ON PARAMETRIC STUDIES, DOSES ARE CALCULATED FOR VERY UNFAVOURABLE, BUT NOT INCREDIBLE WEATHER CONDITIONS. THE PROBABILITY OF SUCH CONDITIONS IN COMBINATION WITH WIND DIRECTION TOWARDS DANISH TERRITORY IS ESTIMATED. DOSES TO BONE MARROW, LUNGS, GI-TRACT AND THYROID ARE CALCULATED USING DOSE MODELS DEVELOPED AT RIS9. THESE DOSES ARE FOUND TO BE CONSISTENT WITH DOSES CALCULATED WITH THE MODELS USED IN WASH-1400.
MH - *ACCIDENTS, OCCUPATIONAL ; *AIR POLLUTION, RADIOACTIVE/ANALYSIS
MH - BONE MARROW/RADIATION EFFECTS ; COMPUTERS ; DENMARK
MH - ENVIRONMENTAL EXPOSURE ; GASTROINTESTINAL SYSTEM/RADIATION EFFECTS
MH - HUMAN ; LUNG/RADIATION EFFECTS ; MATHEMATICS ; MODELS, THEORETICAL
MH - *NUCLEAR REACTORS ; RADIATION DOSAGE ; RISK ; SWEDEN
MH - THYROID GLAND/RADIATION EFFECTS ; WEATHER
LA - ENG
SO - RISO REP 1977 OCT;(356):1-59

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1 AU - CASEBY NG ; PORTER MF
TI - BLAST INJURIES TO THE LUNGS: CLINICAL PRESENTATION, MANAGEMENT AND COURSE.
AB - FIVE PATIENTS WITH BLAST INJURIES TO THE LUNGS AFTER BOMB EXPLOSIONS ARE REPORTED. IN EACH PATIENT RADIOLOGICAL CHANGES WERE APPARENT ON THE INITIAL CHEST FILM TAKEN WITHIN 4 HOURS OF THE EXPLOSIONS. ARTERIAL HYPOXAEMIA WAS ALSO PRESENT. FOUR PATIENTS WERE ACTIVELY TREATED WITH CONTINUOUS POSITIVE-PRESSURE VENTILATION, WHICH WAS ADJUDGED EFFECTIVE THERAPY. TWO PATIENTS DIED, ONE OWING TO BILATERAL PNEUMOTHORAX WHICH OCCURRED DURING ANAESTHESIA, AND THE OTHER OWING TO OVERWHELMING INFECTION. HYPOXAEMIA PERSISTED FOR 4 MONTHS IN ONE OF THE SURVIVORS. LUNG FUNCTION TESTS WHICH WERE PERFORMED ON THE SAME PATIENT 10 MONHTS AFTER THE BLAST INJURIES, HOWEVER, WERE NORMAL.
MH - ADULT ; ANOXEMIA/THERAPY ; BLAST INJURIES/DIAGNOSIS/*THERAPY
MH - CARBON DIOXIDE/BLOOD ; CASE REPORT ; FEMALE ; HUMAN
MH - LUNG/*INJURIES/RADIOGRAPHY ; MALE ; OXYGEN/BLOOD
MH - PNEUMOTHORAX/ETIOLOGY
MH - POSITIVE PRESSURE RESPIRATION/ADVERSE EFFECTS
LA - ENG
SO - INJURY AUG 76:8(1):1-12

2 AU - COPPEL DL
TI - BLAST INJURIES OF THE LUNGS.
AB - UP UNTIL 1969 NORTHERN IRELAND WAS A RELATIVELY PEACEFUL COMMUNITY. THE OUTBREAK OF CIVIL DISTURBANCE HAS RESULTED IN MANY PATIENTS BEING ADMITTED TO HOSPITAL WITH SEVERE INJURIES FROM BULLETS AND BOMB EXPLOSIONS. INITIAL RESUSCITATION MUST NOT BE UNDULY DELAYED TO BE EFFECTIVE AND SHOULD BE CARRIED OUT BY EXPERIENCED PERSONNEL. RESPIRATORY FAILURE FROM BOMB EXPLOSIONS IS RARE AND INVARIABLY FATAL. THE MECHANISM IS DISCUSSED AND IS THOUGHT TO BE DUE TO DIRECT COMPRESSION.
MH - BLAST INJURIES/COMPLICATIONS/PATHOLOGY/*THERAPY ; CIVIL DISORDERS
MH - HUMAN ; INTUBATION, INTRATRACHEAL ; LUNG/*INJURIES/PATHOLOGY
MH - NORTHERN IRELAND ; RESPIRATORY INSUFFICIENCY/ETIOLOGY
MH - WOUNDS, GUNSHOT/COMPLICATIONS
LA - ENG
SO - BR J SURG OCT 76:63(10):735-7

3 AU - TAKISHIMA T
TI - DYNAMIC CHARACTERISTICS OF THE LARGE AIRWAY
MH - ANIMAL ; BRONCHI/*PHYSIOLOGY ; DOGS ; HUMAN ; LUNG COMPLIANCE
MH - MODELS, THEORETICAL
LA - JPN
SO - RESPIR CIRC (TOKYO) JUL 76:24(7):599-602

4 AU - KAMBE M ; HIRAMOTO T ; NISHIDA O
TI - STUDIES ON PATHOPHYSIOLOGY OF LARGE AIRWAY AND SMALL AIRWAY BY MEANS OF AN ANALYSIS USING SIMULATION TECHNIQUE (AUTHOR'S TRANSL)
MH - AIRWAY RESISTANCE ; BRONCHI/*PHYSIOPATHOLOGY ; HUMAN
MH - LUNG COMPLIANCE ; LUNG DISEASES, OBSTRUCTIVE/PHYSIOPATHOLOGY
MH - MODELS, THEORETICAL
LA - JPN
SO - RESPIR CIRC (TOKYO) JUL 76;24(7):565-71

5 AU - COPPEL DL ; MILLER TD
TI - RESUSCITATION AND TRAUMA.
MH - BLAST INJURIES/THERAPY ; BRAIN INJURIES, ACUTE/THERAPY
MH - DISSEMINATED INTRAVASCULAR COAGULATION/THERAPY
MH - EMERGENCY SERVICE, HOSPITAL ; HUMAN ; LUNG/INJURIES
MH - RESUSCITATION/INSTRUMENTATION/*METHODS ; REVIEW
MH - TRANSPORTATION OF PATIENTS ; WOUNDS AND INJURIES/*THERAPY
LA - ENG
SO - INT ANESTHESIOL CLIN SPRING 76;14(1):43-68

6 AU - WATERWORTH TA ; CARR MJ
TI - AN ANALYSIS OF THE POST-MORTEM FINDINGS IN THE 21 VICTIMS OF THE BIRMINGHAM PUB BOMBINGS.
AB - ON THE EVENING OF 21 NOVEMBER, 1974 EXPLOSIONS OCCURRED ALMOST SIMULTANEOUSLY IN TWO CROWDED PUBLIC HOUSES IN THE CENTRE OF BIRMINGHAM. OF THE 21 PEOPLE WHO DIED, 18 WERE KILLED OUTRIGHT AND 3 DIED LATER IN HOSPITAL. ALL 21 CASES SHOWED THE TERRIBLE MULTIPLE INJURIES ASSOCIATED WITH CLOSE PROXIMITY TO A POWERFUL EXPLOSION WITHIN A CONFINED SPACE. ALTHOUGH ALL THE VICTIMS SUFFERED ONE OR MORE INJURIES WHICH ALONE WOULD HAVE BEEN FATAL, CERTAIN PATTERNS OF INJURY WERE NOTED WHICH, IF APPRECIATED EARLY IN ANY FUTURE SIMILAR INCIDENT, MAY HELP TO SAVE THE LIVES OF THOSE WHO ARE FUTHER REMOVED FROM THE CENTRE OF THE EXPLOSION OR EXPOSED TO ONE OF LESSER FORCE.
MH - ABDOMINAL INJURIES/PATHOLOGY ; BLAST INJURIES/*PATHOLOGY
MH - BONE AND BONES/INJURIES ; BURNS/PATHOLOGY ; ENGLAND
MH - HEAD INJURIES/PATHOLOGY ; HEART INJURIES/PATHOLOGY ; HUMAN
MH - LUNG/INJURIES ; MUSCLES/INJURIES ; NECK/INJURIES
MH - THORACIC INJURIES/PATHOLOGY
LA - ENG
SO - INJURY NOV 75;7(2):89-95

7 AU - ROBERT M
TI - OXYGEN AFFINITY OF HAEMOGLOBIN (AUTHOR'S TRANSL)
MH - ALTITUDE ; ANEMIA/BLOOD ; ANOXIA/BLOOD ; BLOOD TRANSFUSION
MH - CARBON MONOXIDE POISONING/BLOOD ; CORONARY DISEASE/BLOOD
MH - DIPHOSPHOGLYCERIC ACIDS/METABOLISM ; HEMOGLOBINS/*PHYSIOLOGY
MH - HUMAN ; HYDROGEN/PHYSIOLOGY ; LUNG/PHYSIOLOGY
MH - MODELS, THEORETICAL ; OXYGEN CONSUMPTION
MH - OXYGEN/*METABOLISM/BLOOD ; OXYHEMOGLOBINS/PHYSIOLOGY
MH - PARTIAL PRESSURE ; HYDROGEN-ION CONCENTRATION
MH - RESPIRATORY INSUFFICIENCY/BLOOD ; REVIEW
LA - FRE

SO - BULL PHYSIOPATHOL RESPIR (NANCY) JAN-FEB 75;11(1):79-170

8 AU - YAMADA K ; SUGITA M
TI - PROCEEDINGS: ANALYSIS OF XE-133 WASH OUT CURVE BY A SIMULATION MODEL
MH - HUMAN ; LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL
MH - XENON RADIOISOTOPES/*DIAGNOSTIC USE
LA - JPN
SO - J PHYSIOL SOC JPN 1 SEP 74;36(8-9):373-4

9 AU - STEGEMANN J ; SEEZ P ; KREMER W ; BONING D
TI - A MATHEMATICAL MODEL OF THE VENTILATORY CONTROL SYSTEM TO CARBON DIOXIDE WITH SPECIAL REFERENCE TO ATHLETES AND NONATHLETES.
AB - THE VENTILATORY RESPONSE CURVE (VRC) AS A FUNCTION OF ALVEOLAR AND ARTERIAL PCO2 WAS RECORDED IN 6 HIGH-PERFORMANCE ATHLETES AND 6 NONATHLETES. THE BEST FIT TO THE DATA POINTS COULD BE FOUND FOR AN EQUATION OF THE FORM (SEE ARTICLE) SHOWING THAT THE RESULTS ARE STRONGLY RELATED TO A GAUSSIAN PROBABILITY DENSITY FUNCTION (PDF). AFTER NORMALIZING THE EQUATION TO A FORM (SEE ARTICLE) (M = MEAN VALUE OF PDF), SIGMA, A AND M COULD BE DETERMINED FOR BOTH GROUPS. SIGMA AND A ARE SMALLER IN THE ATHLETIC GROUP, WHEREAS M DID NOT SHOW ANY SYSTEMATIC DIFFERENCE. REGARDING THE RESPIRATORY CENTER CONSISTING OF FUNCTIONAL *ELEMENTS RESPONDING INDIRECTLY TO VARIABLE PCO2 IT CAN BE CONCLUDED THAT THE FREQUENCY DISTRIBUTION OF THE DIFFERENT ACTIVE ELEMENTS IS GREATER AND SPREAD OVER A WIDER PCO2 RANGE IN THE NONATHLETES WITH THE SAME MEAN VALUE IN BOTH GROUPS. USING LOESCHCKE'S MODEL (1960), THE OPEN LOOP GAIN FACTOR FOR DIFFERENT V CO2 AS A FUNCTION OF P(A)CO2 WAS COMPUTED; THE GAIN FACTOR SHOWED A MAXIMUM IN THE PHYSIOLOGICAL RANGE OF PCO2.
MH - ADULT ; ARTERIES ; CARBON DIOXIDE/*METABOLISM/BLOOD ; HUMAN ; MALE
MH - MATHEMATICS ; MODELS, THEORETICAL ; PULMONARY ALVEOLI
MH - *RESPIRATION ; RESPIRATORY CENTER/PHYSIOLOGY ; SPORTS MEDICINE
MH - *SPORTS
LA - ENG
SO - PFLUEGERS ARCH 1975;356(3):223-36

10 AU - TUCKER K ; LETTIN A
TI - THE TOWER OF LONDON BOMB EXPLOSION.
AB - AFTER THE DETONATION OF A BOMB IN THE TOWER OF LONDON 37 PEOPLE WERE BROUGHT TO ST. BARTHOLOMEW'S HOSPITAL. THE EXPLOSION CAUSED NUMEROUS SEVERE INJURIES OF A TYPE RARELY SEEN IN PEACETIME.
MH - ABDOMINAL INJURIES/THERAPY ; ADOLESCENCE
MH - BLAST INJURIES/*THERAPY/SURGERY ; BURNS/THERAPY ; CHILD
MH - EAR/INJURIES ; *EXPLOSIONS ; EYE INJURIES/THERAPY
MH - FRACTURES/THERAPY ; HEAD INJURIES/THERAPY
MH - EMERGENCY SERVICE, HOSPITAL ; HUMAN ; JOINTS/INJURIES ; LONDON
MH - LUNG/INJURIES ; MALE ; MENTAL DISORDERS/ETIOLOGY
MH - ORGANIZATION AND ADMINISTRATION ; WOUND INFECTION/THERAPY
LA - ENG
SO - BR MED J 2 AUG 75;3(5978):287-90

11 AU - MORROW WF
TI - BLAST INJURIES TO THE LUNGS.
MH - *BLAST INJURIES ; EXPLOSIONS ; HUMAN ; LUNG/*INJURIES
LA - ENG
SO - NURS TIMES 17 JUL 75;71(29):1136-7

12 AU - TOYOOKA H
TI - ANESTHESIOLOGY AND TRANSIENT PHENOMENA (3)
MH - *ANESTHESIA ; LUNG/PHYSIOLOGY ; MATHEMATICS ; MODELS, THEORETICAL
LA - JPN
SO - JPN J ANESTHESIOL MAR 75;24(3):266-72

13 AU - CHANG H ; TAI RC ; FARHI LE
TI - SOME IMPLICATIONS OF TERNARY DIFFUSION IN THE LUNG.
AB - DIFFUSION IN THE LUNG NORMALLY INVOLVES THREE GASES AND THE GOVERNING LAWS ARE STEFAN-MAXWELL EQUATIONS RATHER THAN THE MORE FAMILIAR FICK'S LAW. A SIMPLE GAS FILM MODEL IS STUDIED MATHEMATICALLY TO (1) DEMONSTRATE THAT THE RATE OF DIFFUSION OF A COMPONENT GAS MAY BE ZERO EVEN THOUGH ITS CONCENTRATION GRADIENT IS NOT ZERO (KNOWN AS "DIFFUSION BARRIER), THAT THE RATE OF DIFFUSION OF A COMPONENT GAS MAY NOT BE ZERO EVEN THOUGH ITS CONCENTRATION GRADIENT IS ZERO ("OSMOTIC DIFFUSION), AND THAT A COMPONENT GAS MAY DIFFUSE AGAINST THE GRADIENT OF ITS CONCENTRATION ("REVERSE DIFFUSION); (2) COMPARE THE DISCREPANCY BETWEEN RESULTS OBTAINED BY BINARY AND TERNARY LAWS SEPARATELY; (3) DETERMINE THE IMPORTANCE OF TERNARY DIFFUSION AT HIGH PRESSURE. THE FINDINGS FROM THE MODEL STUDY SUGGEST THAT THE EFFECTS OF TERNARY DIFFUSION MAY NOT BE PRONOUNCED WHEN AIR IS BREATHED UNDER NORMAL CONDITIONS, BUT THE BEHAVIOR OF HELIUM MIXTURES DEVIATE SIGNIFICANTLY FROM THAT DESCRIBED BY BINARY DIFFUSION LAWS.
MH - BIOLOGICAL TRANSPORT ; CARBON DIOXIDE/BLOOD ; DIFFUSION
MH - *GASES/METABOLISM ; HUMAN ; LUNG/*PHYSIOLOGY/METABOLISM
MH - MATHEMATICS ; MODELS, BIOLOGICAL ; MODELS, THEORETICAL
MH - PARTIAL PRESSURE ; PRESSURE
MH - UNITED STATES GOV'T SUPPORTED, P.H.S.
MH - UNITED STATES GOV'T SUPPORTED
LA - ENG
SO - RESPIR PHYSIOL JAN 75;23(1):109-20

14 AU - MCALISTER R
TI - INTENSIVE CARE OF BOMB-BLAST INJURIES.
MH - BLAST INJURIES/*THERAPY/NURSING ; CIVIL DISORDERS ; FEMALE
MH - HOSPITALS, TEACHING ; HUMAN ; LUNG/INJURIES ; MALE
MH - NORTHERN IRELAND ; *RESPIRATORY CARE UNITS
LA - ENG
SO - NURS MIRROR 14 NOV 74;139(20):66-8

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15 AU - MALYKHIN VM ; BELLE IUS ; MOROZ GL
TI - DOSAGE EVALUATION IN INHALATION OF THE PRODUCTS OF NUCLEAR FISSION WITH THE AID OF LUNG RADIOMETRY
MH - ENGLISH ABSTRACT ; HUMAN ; LUNG/*RADIATION EFFECTS
MH - MODELS, THEORETICAL ; *NUCLEAR FISSION ; *RADIATION DOSAGE
MH - *RADIATION EFFECTS ; RADIOISOTOPES/ADMINISTRATION & DOSAGE
MH - RADIOMETRY/INSTRUMENTATION
LA - RUS
SO - MED RADIOL (MOSK) NOV 74;19(11):43-9

16 AU - LOUTE G
TI - LUNG AND LIPIDS (AUTHOR'S TRANSL)
MH - CHEMISTRY ; ENGLISH ABSTRACT ; HUMAN
MH - HYALINE MEMBRANE DISEASE/PHYSIOPATHOLOGY ; INFANT, NEWBORN
MH - LIPIDS/*METABOLISM/BLOOD ; LUNG DISEASES/METABOLISM
MH - LUNG/*METABOLISM/PHYSIOLOGY ; MODELS, THEORETICAL
MH - OXYGEN/PHYSIOLOGY ; PHOSPHOLIPIDS/METABOLISM
MH - PULMONARY ALVEOLI/PHYSIOLOGY
MH - PULMONARY SURFACTANT/PHYSIOLOGY/BIOSYNTHESIS ; RESPIRATION
MH - REVIEW ; SURFACE TENSION ; TRIGLYCERIDES/METABOLISM
LA - FRE
SO - ACTA TUBERC PNEUMOL BELG MAR-APR 74;65(2):177-99

17 AU - PR EFAUT C ; RAMONATXO M ; CHARDON G
TI - EFFECT OF AN ARTIFICIAL INCREASE IN DEAD SPACE ON PARTIAL CONDUCTANCE OF CARBON MONOXIDE
MH - ADULT ; ATMOSPHERIC PRESSURE ; *CARBON MONOXIDE ; FEMALE ; HUMAN
MH - MALE ; MODELS, THEORETICAL ; PULMONARY ALVEOLI/PHYSIOLOGY
MH - *RESPIRATION ; *RESPIRATORY DEAD SPACE ; VITAL CAPACITY
LA - FRE
SO - C R SOC BIOL (PARIS) 1973;167(12):1879-81

*18 AU - WOESTIJNE KP VAN DE ; CLEMENT J ; PARDAENS J
TI - CONSEQUENCES OF PULMONARY ELASTICITY ON THE STABILIZATION OF THE BRONCHI.
MH - BRONCHI/*PHYSIOLOGY ; *ELASTICITY ; HUMAN ; LUNG COMPLIANCE
MH - LUNG/*PHYSIOLOGY ; MATHEMATICS ; MODELS, THEORETICAL
MH - PLEURA/PHYSIOLOGY ; PRESSURE ; RESPIRATION
LA - ENG
SO - BULL PHYSIOPATHOL RESPIR (NANCY) JAN-FEB 74;10(1):93-102

19 AU - HATZFELD C ; NURY AM
TI - WASH-OUT METHODS OF A TRACING GAS FOR STUDY OF PULMONARY MIXING (RADIOACTIVE GASES NON INCLUDED) (AUTHOR'S TRANSL)
MH - BLOOD GAS ANALYSIS ; ENGLISH ABSTRACT ; HUMAN ; IRRIGATION
MH - LUNG/PHYSIOLOGY ; MATHEMATICS ; MODELS, THEORETICAL
MH - NITROGEN/BLOOD ; OXYGEN/BLOOD ; PULMONARY DIFFUSING CAPACITY
MH - RESPIRATION ; RESPIRATORY DEAD SPACE
MH - RESPIRATORY FUNCTION TESTS/*METHODS ; REVIEW
MH - VENTILATION-PERFUSION RATIO
LA - FRE
SO - BULL PHYSIOPATHOL RESPIR (NANCY) MAR-APR 74;10(2):177-215

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20 AU - SANTUCCI J ; BARRES G ; LE BIHAN E
TI - NON-STEADY STATE VARIATIONS OF OF PACO2 FOLLOWING CHANGES IN ALVEOLAR VENTILATION (AUTHOR'S TRANSL)
MH - CARBON DIOXIDE/BLOOD ; COMPARATIVE STUDY ; ENGLISH ABSTRACT
MH - HUMAN ; MODELS, THEORETICAL ; OXYGEN/*BLOOD ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY ; RESPIRATION ; SPIROMETRY
MH - TIME FACTORS
LA - FRE
SO - BULL PHYSIOPATHOL RESPIR (NANCY) JAN-FEB 74;10(1):27-37

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1 AU - COHEN L
TI - LETTER: CLONES, MICROCOLONIES OR *TUMOURLETS IN IRRADIATED LUNG.
MH - CLONE CELLS ; COMPUTERS ; COMPUTERS
MH - *DOSE-RESPONSE RELATIONSHIP, RADIATION ; HUMAN
MH - LUNG/*RADIATION EFFECTS ; MODELS, THEORETICAL ; *RADIATION EFFECTS
MH - RADIOTHERAPY DOSAGE
LA - ENG
SO - BR J RADIOL FEB 74;47(554):154

2 AU - SAIDEL GM ; MILITANO TC ; CHESTER EH
TI - A THEORETICAL BASIS FOR ASSESSING PULMONARY MEMBRANE TRANSPORT. CONTINUOUS CO MONITORING DURING A SINGLE-BREATH MANEUVER.
MH - CARBON MONOXIDE ; DIFFUSION ; HUMAN
MH - LUNG DISEASES, OBSTRUCTIVE/*PHYSIOPATHOLOGY ; METHODS
MH - MODELS, THEORETICAL
MH - PULMONARY ALVEOLI/*PHYSIOLOGY/PHYSIOPATHOLOGY ; *RESPIRATION
LA - ENG
SO - BULL PHYSIOPATHOL RESPIR (NANCY) MAR-APR 73;9(2):461-96

3 AU - CLARKE SW
TI - THE ROLE OF TWO-PHASE FLOW IN BRONCHIAL CLEARANCE.
MH - BRONCHI/PHYSIOPATHOLOGY/*PHYSIOLOGY ; BRONCHITIS/PHYSIOPATHOLOGY
MH - CHRONIC DISEASE ; ELASTICITY ; HUMAN ; MODELS, THEORETICAL
MH - RESPIRATION ; *RESPIRATORY AIRFLOW ; RHEOLOGY ; *SPUTUM
MH - VISCOSITY
LA - ENG
SO - BULL PHYSIOPATHOL RESPIR (NANCY) MAR-APR 73;9(2):359-76

4 AU - ROULLIER A ; HUMASSON JP ; LAVANDIER M ; MOLINE J ; BAUDOUIN J
TI - DETERMINATION OF THE MEMBRANE FACTOR IN ALVEOLO-CAPILLARY EXCHANGES. CLINICAL APPLICATION
MH - CAPILLARIES/*PHYSIOLOGY ; CAPILLARY PERMEABILITY
MH - CARBON MONOXIDE/METABOLISM ; DIFFUSION ; ENGLISH ABSTRACT ; HUMAN
MH - MEMBRANES/PHYSIOLOGY ; METHODS ; MODELS, THEORETICAL
MH - OXYGEN/METABOLISM ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY ; PULMONARY FIBROSIS/PHYSIOPATHOLOGY
MH - RESPIRATORY INSUFFICIENCY/PHYSIOPATHOLOGY
MH - RESPIRATORY TRACT DISEASES/PHYSIOPATHOLOGY ; SOLUBILITY
MH - VENTILATION-PERFUSION RATIO
LA - FRE
SO - POUMON COEUR FEB 73;29(2):131-6 PASSIM

5 AU - AWAD JA
TI - EXTRAPULMONARY RESPIRATION: A REVIEW.
MH - BLOOD TRANSFUSION ; CARDIAC OUTPUT ; COLD
MH - EXTRACORPOREAL CIRCULATION ; HEART, MECHANICAL
MH - HISTORY OF MEDICINE, 19TH CENT. ; HISTORY OF MEDICINE, 20TH CENT.
MH - HUMAN ; HYDROGEN PEROXIDE/ADMINISTRATION & DOSAGE/ADVERSE EFFECTS
MH - INJECTIONS ; INJECTIONS, INTRAPERITONEAL ; LUNG/PHYSIOLOGY
MH - MODELS, THEORETICAL
MH - OXYGEN/ADMINISTRATION & DOSAGE/BLOOD/TOXICITY ; OXYGEN CONSUMPTION
MH - OXYGENATORS ; OXYGENATORS, MEMBRANE ; PARABIOSIS

MH - PERFUSION/HISTORY ; *RESPIRATION, ARTIFICIAL ; REVIEW
MH - TIME FACTORS ; TISSUE PRESERVATION
LA - ENG
SO - CAN J SURG JAN 74;17(1):3-15

6 AU - SUWA K
TI - GAS EXCHANGE IN THE LUNG BY STIMULATION (AUTHOR'S TRANSL
MH - CARBON DIOXIDE/BLOOD/METABOLISM ; COMPUTERS ; LUNG/*PHYSIOLOGY
MH - *MODELS, THEORETICAL ; OXYGEN/BLOOD ; PULMONARY CIRCULATION
MH - *RESPIRATION ; REVIEW
LA - JPN
SO - RESPIR CIRC (TOKYO) NOV 73;21(11):996-1003

7 AU - GREMMEL H ; L OHR HH ; GU ACK J
TI - ACUTE LUNG CHANGES FOLLOWING TRAUMA
MH - ACUTE DISEASE ; AORTA, THORACIC/INJURIES ; ATELECTASIS/RADIOGRAPHY
MH - BLAST INJURIES/COMPLICATIONS ; BRONCHI/INJURIES
MH - DIAGNOSIS, DIFFERENTIAL
MH - HERNIA, DIAPHRAGMATIC, TRAUMATIC/RADIOGRAPHY ; EXPLOSIONS
MH - FOREIGN BODIES/RADIOGRAPHY ; HEMOTHORAX/RADIOGRAPHY ; HUMAN ; LUNG
MH - PLEURA/RADIOGRAPHY ; PNEUMOTHORAX/RADIOGRAPHY
MH - RIB FRACTURES/RADIOGRAPHY ; RUPTURE ; STERNUM/INJURIES
MH - THORACIC INJURIES/ETIOLOGY/PHYSIOPATHOLOGY/*RADIOGRAPHY
MH - TRACHEA/INJURIES ; WOUNDS, GUNSHOT
LA - GER
SO - RADIOLOGE MAY 73;13(5):176-86

8 AU - SCRIMGER JW
TI - LUNG CORRECTIONS FOR 8-MV X RAYS.
MH - HUMAN ; LUNG/ANATOMY & HISTOLOGY/*ANATOMY & HISTOLOGY
MH - MATHEMATICS ; METHODS ; MODELS, THEORETICAL ; *RADIOTHERAPY DOSAGE
MH - *RADIOTHERAPY, HIGH ENERGY
LA - ENG
SO - RADIOLOGY NOV 73:109(2):443-5

9 AU - SAUMON G ; GEORGES R ; TURIAF J
TI - PULMONARY VOLUME IN ASTHMA WITH CONTINUOUS DYSPNEA
MH - ASTHMA/*PHYSIOPATHOLOGY ; DYSPNEA/ETIOLOGY ; HUMAN
MH - LUNG/*PHYSIOPATHOLOGY ; METHODS ; MODELS, THEORETICAL
MH - RESPIRATORY DEAD SPACE ; RESPIRATORY FUNCTION TESTS
MH - VITAL CAPACITY
LA - FRE
SO - ANN MED INTERNE (PARIS) FEB 73;124(2):127-33

10 AU - LACHMANN B ; WINSEL K ; REUTGEN H
TI - THE ANTI-ATELECTASIS FACTOR OF THE LUNG. I
MH - ANIMAL ; CARBON DIOXIDE ; EXTRACORPOREAL CIRCULATION ; HUMAN
MH - LUNG/PHYSIOLOGY/PHYSIOPATHOLOGY ; LUNG COMPLIANCE ; MICE
MH - MICROSCOPY, ELECTRON, SCANNING ; MODELS, THEORETICAL
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; PULMONARY EMBOLISM
MH - *PULMONARY SURFACTANT/ANALYSIS/BIOSYNTHESIS/ISOLATION & PURIFICATION/PHYSIOLOGY ; RATS ; RESPIRATION
MH - RESPIRATION, ARTIFICIAL ; REVIEW ; SURFACE TENSION ; VAGOTOMY

MH - VENTILATION-PERFUSION RATIO ; WORK OF BREATHING
LA - GER
SO - Z ERKR ATMUNGSORGANE FEB 73;137(2):257-87

11 AU - DOBBINSON TL ; NISBET HI ; PELTON DA
TI - FUNCTIONAL RESIDUAL CAPACITY (FRC) AND COMPLIANCE IN ANAESTHETIZED PARALYSED CHILDREN. I. IN VITRO TESTS WITH THE HELIUM DILUTION METHOD OF MEASURING FRC.
MH - *ANESTHESIA, INHALATION/INSTRUMENTATION ; CHILD ; GASES
MH - HALOTHANE ; HELIUM ; HUMAN ; LUNG/*PHYSIOLOGY ; *LUNG COMPLIANCE
MH - MATHEMATICS ; METHOXYFLURANE ; MODELS, THEORETICAL ; NITROGEN
MH - NITROUS OXIDE ; OXYGEN ; *PARALYSIS ; SPIROMETRY
LA - ENG
SO - CAN ANAESTH SOC J MAY 73;20(3):310-21

12 AU - HAMIT HF
TI - PRIMARY BLAST INJURIES.
MH - ABDOMINAL INJURIES
MH - *BLAST INJURIES/COMPLICATIONS/RADIOGRAPHY/THERAPY
MH - EMBOLISM, AIR/ETIOLOGY ; EXPLOSIONS ; EYE INJURIES/THERAPY
MH - HEMORRHAGE/ETIOLOGY ; HUMAN ; OCCUPATIONAL MEDICINE
MH - LABYRINTH/INJURIES ; LUNG/INJURIES ; MALE ; NAVAL MEDICINE
MH - THORACIC INJURIES/COMPLICATIONS/RADIOGRAPHY
LA - ENG
SO - IND MED SURG MAR 73;42(3):14-21

13 AU - MCCAUGHEY W ; COPPEL DL ; DUNDEE JW
TI - BLAST INJURIES TO THE LUNGS. A REPORT OF TWO CASES.
MH - ADULT ; ATMOSPHERIC PRESSURE
MH - *BLAST INJURIES/COMPLICATIONS/DIAGNOSIS/THERAPY
MH - DIAGNOSIS, DIFFERENTIAL ; FEMALE ; FUROSEMIDE/THERAPEUTIC USE
MH - HUMAN ; HYDROCORTISONE/THERAPEUTIC USE ; LUNG/*INJURIES
MH - OXYGEN INHALATION THERAPY ; POSITIVE PRESSURE RESPIRATION
MH - PRESSURE ; PULMONARY EDEMA/DRUG THERAPY/ETIOLOGY
MH - RESPIRATORY INSUFFICIENCY/DIAGNOSIS/ETIOLOGY
LA - ENG
SO - ANAESTHESIA JAN 73;28(1):2-9

14 AU - MORROW PE
TI - ALVEOLAR CLEARANCE OF AEROSOLS.
MH - *AEROSOLS/METABOLISM ; BASEMENT MEMBRANE/PHYSIOLOGY
MH - CELL MEMBRANE PERMEABILITY ; CILIA/PHYSIOLOGY ; DUST ; HUMAN
MH - LYMPHATIC SYSTEM ; MACROPHAGES/PHYSIOLOGY ; MODELS, THEORETICAL
MH - MUCOUS MEMBRANE/PHYSIOLOGY ; PHAGOCYTOSIS
MH - PULMONARY ALVEOLI/CYTOLOGY/*PHYSIOLOGY/METABOLISM
MH - PULMONARY SURFACTANT/PHYSIOLOGY ; *RESPIRATION ; REVIEW
LA - ENG
SO - ARCH INTERN MED JAN 73;131(1):101-8

15 AU - MAGNUS L ; STAUCH GW ; STRODTGES MW
TI - PULMONARY RADIATION EXPOSURE FOLLOWING ENDOLYMPHATIC THERAPY. I. DOSIMETRIC STUDIES ON A MODEL
MH - ANTHROPOMETRY ; ENGLISH ABSTRACT ; HALF-LIFE
MH - *LUNG/ANATOMY & HISTOLOGY ; LYMPHATIC SYSTEM ; METHODS
MH - MODELS, THEORETICAL ; RADIOMETRY ; *RADIOTHERAPY DOSAGE
MH - THORAX/ANATOMY & HISTOLOGY
LA - GER
SO - STRAHLENTHERAPIE JUL 72;144(1):1-7

16 AU - SIEGEL JH ; FARRELL EJ ; LEWIN I
TI - QUANTIFYING THE NEED FOR CARDIAC SUPPORT IN HUMAN SHOCK BY A FUNCTIONAL MODEL OF CARDIOPULMONARY VASCULAR DYNAMICS: WITH SPECIAL REFERENCE TO MYOCARDIAL INFARCTION.
MH - CARDIAC OUTPUT ; *CORONARY CIRCULATION ; DYE DILUTION TECHNIC
MH - HEART/PHYSIOPATHOLOGY ; HUMAN ; INDICATOR DILUTION TECHNICS
MH - LUNG/PHYSIOPATHOLOGY ; *MODELS, THEORETICAL
MH - MYOCARDIAL INFARCTION/*COMPLICATIONS ; *PULMONARY CIRCULATION
MH - SHOCK, CARDIOGENIC/*PHYSIOPATHOLOGY
LA - ENG
SO - J SURG RES OCT 72;13(4):166-61

17 AU - COHEN M
TI - CLINICAL DOSIMETRY.
MH - COBALT ISOTOPES ; COMPUTERS
MH - DOSE-RESPONSE RELATIONSHIP, RADIATION ; HUMAN
MH - LUNG/RADIATION EFFECTS ; MATHEMATICS ; MODELS, THEORETICAL
MH - NEOPLASMS/DIAGNOSIS/RADIOTHERAPY ; RADIATION EFFECTS
MH - RADIONUCLIDE IMAGING ; RADIOISOTOPE TELETHERAPY ; *RADIOMETRY
MH - *RADIOTHERAPY DOSAGE ; REVIEW ; THERMOLUMINESCENT DOSIMETRY
LA - ENG
SO - MOD TRENDS RADIOTHER 1972;2:247-65

18 AU - POZDNEEV DB ; MIKHEICHEV VV ; KOPYTKIN IUV
TI - CALCULATION OF THE ENERGY SPECTRA OF ELECTRONS IN HETEROGENOUS TISSUE EQUIVALENT MEDIA BY THE MONTE CARLO METHOD
MH - ADIPOSE TISSUE/*RADIATION EFFECTS
MH - BONE AND BONES/*RADIATION EFFECTS ; COMPUTERS ; ELECTRONS
MH - ENGLISH ABSTRACT ; HUMAN ; LUNG/*RADIATION EFFECTS ; MATHEMATICS
MH - METHODS ; MODELS, THEORETICAL ; MUSCLES/*RADIATION EFFECTS
MH - RADIATION DOSAGE ; *RADIATION EFFECTS ; *RADIOMETRY
LA - RUS
SO - MED RADIOL (MOSK) MAY 72;17(5):50-61

19 AU - TAKISHIMA T ; SASAKI H ; NAKAMURA T
TI - TWO DIMENSIONAL FLOW MODEL FOR ANALYSIS OF EXPIRATORY CHECK VALVE.
MH - ANIMAL ; BRONCHI/*PHYSIOLOGY ; DOGS ; LUNG COMPLIANCE
MH - MATHEMATICS ; *MODELS, THEORETICAL ; PRESSURE ; *RESPIRATION
MH - RESPIRATORY AIRFLOW
LA - ENG
SO - TOHOKU J EXP MED APR 72;106(4):311-27

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20 AU - WEBSTER I ; BLUM LJ
TI - TRAUMATIC LUNG.
MH - BLAST INJURIES/COMPLICATIONS ; CAPILLARIES/PATHOLOGY
MH - EMBOLISM, FAT/ETIOLOGY
MH - EXTRACORPOREAL CIRCULATION/ADVERSE EFFECTS
MH - HEAD INJURIES/COMPLICATIONS ; HUMAN ; LUNG/*INJURIES/PATHOLOGY
MH - LUNG DISEASES/PATHOLOGY/*ETIOLOGY ; MICROSCOPY, ELECTRON
MH - PULMONARY EDEMA/ETIOLOGY ; PULMONARY EMBOLISM/ETIOLOGY
MH - SHOCK, TRAUMATIC/COMPLICATIONS ; THORACIC INJURIES/COMPLICATIONS
LA - ENG
SO - FORENSIC SCI JUL 72;1(2):167-78

21 AU - KOPYTKIN IUB ; POZONEEV DB ; SPERANSKI I SK
TI - ESTIMATION OF DEPTH GAMMA-RADIATION SPECTRA IN TISSUE-EQUIVALENT PHANTOMS USING THE MONTE CARLO METHOD
MH - ENGLISH ABSTRACT ; HUMAN ; LUNG/RADIATION EFFECTS ; METHODS
MH - MODELS, STRUCTURAL ; MODELS, THEORETICAL
MH - MUSCLES/RADIATION EFFECTS ; *OPERATIONS RESEARCH
MH - *RADIATION DOSAGE
LA - RUS
SO - MED RADIOL (MOSK) MAR 72;17(3):76-87

22 AU - JAFFE CC
TI - A NEW TECHNIQUE FOR RAPID DETERMINATION OF QUANTITATIVE DATA FROM RADIOGRAPHS.
MH - COMPUTERS ; HEART VENTRICLE/RADIOGRAPHY ; HUMAN
MH - KIDNEY/RADIOGRAPHY ; LUNG/RADIOGRAPHY ; METHODS
MH - MODELS, THEORETICAL ; *TECHNOLOGY, RADIOLOGIC
LA - ENG
SO - RADIOLOGY MAY 72;103(2):451-3

23 TI - ABSORPTION AND EXCRETION OF TOXIC METALS.
MH - ADMINISTRATION, ORAL ; ANIMAL ; BODY BURDEN ; FECES ; HALF-LIFE
MH - HUMAN ; INJECTIONS, INTRAPERITONEAL ; INJECTIONS, INTRAVENOUS
MH - INTESTINAL ABSORPTION ; LUNG/METABOLISM
MH - METALS/*METABOLISM/ADMINISTRATION & DOSAGE/BLOOD/URINE ; METHODS
MH - MODELS, THEORETICAL ; RADIOISOTOPES ; RESPIRATION
MH - RESPIRATORY SYSTEM/METABOLISM ; SKIN ABSORPTION ; TIME FACTORS
MH - WHOLE BODY COUNTING
LA - ENG
SO - NORD HYG TIDSKR 1971:52(2):70-104

24 AU - MORETTI G ; FONTANESI S
TI - ORGANIC LESIONS DUE TO UNDERWATER EXPLOSIONS. SURVEY OF ETIOPATHOGENETIC, CLINICAL AND ANATOMO-PATHOLOGICAL DATA. ORIGINAL EXPERIMENTAL
MH - ABDOMEN/INJURIES ; BLAST INJURIES/*PATHOLOGY
MH - CENTRAL NERVOUS SYSTEM/INJURIES ; DIVING ; ENGLISH ABSTRACT
MH - HUMAN ; *IMMERSION ; LUNG/INJURIES ; NAVAL MEDICINE
LA - ITA
SO - ANN MED NAV (ROMA) OCT-DEC 71;76(5):455-72

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25 AU - BRODY JS ; COBURN RF
TI - EFFECTS OF ELEVATED CARBOXYHEMOGLOBIN ON GAS EXCHANGE IN THE LUNG.
MH - ANEMIA/ETIOLOGY ; ANOXEMIA/ETIOLOGY ; CARBON MONOXIDE/*BLOOD
MH - CARBON MONOXIDE POISONING/COMPLICATIONS ; HEMOGLOBINS/*ANALYSIS
MH - HYDROGEN-ION CONCENTRATION ; MATHEMATICS ; MODELS, THEORETICAL
MH - OXYGEN/BLOOD ; PARTIAL PRESSURE ; PULMONARY ALVEOLI/*PHYSIOLOGY
MH - PULMONARY CIRCULATION ; *RESPIRATION
LA - ENG
SO - ANN NY ACAD SCI 5 OCT 70;174(1):255-60

26 AU - SCHER AM ; OHM WJ ; KERRICK WG ; LEWIS SM ; YOUNG AC
TI - EFFECTS OF BODY SURFACE BOUNDARY AND OF TISSUE INHOMOGENEITY ON THE ELECTROCARDIOGRAM OF THE DOG.
MH - ANIMAL ; *BODY COMPOSITION ; COMPUTERS ; DEATH ; DOGS
MH - *ELECTRIC CONDUCTIVITY ; ELECTRIC STIMULATION
MH - *ELECTROCARDIOGRAPHY ; HEART/PHYSIOLOGY ; LUNG/PHYSIOLOGY
MH - MATHEMATICS ; MODELS, STRUCTURAL ; MODELS, THEORETICAL
MH - SURFACE PROPERTIES ; THORAX/*PHYSIOLOGY
LA - ENG
SO - CIRC RES DEC 71;29(6):600-9

27 AU - FUKUDA K ; MIYAKE H ; OKADA A
TI - A MATHEMATICAL SIMULATION OF BODY BURDEN WITH INHALED MERCURY VAPOR.
MH - ANIMAL ; BRAIN/METABOLISM ; FECES/METABOLISM ; GASES
MH - KIDNEY/METABOLISM ; KINETICS ; LUNG/METABOLISM ; MATHEMATICS
MH - MERCURY/URINE/*METABOLISM ; *MODELS, THEORETICAL ; RATS
MH - RESPIRATION
LA - ENG
SO - JAP J HYG AUG 71;26(3):285-90

28 AU - LINHARTOV A A ; ANDERSON AE JR ; FORAKER AG
TI - RADIAL TRACTION AND BRONCHIOLAR OBSTRUCTION IN PULMONARY EMPHYSEMA. OBSERVED AND THEORETICAL ASPECTS.
MH - BRONCHI/*PATHOLOGY ; HUMAN ; MALE ; MIDDLE AGE
MH - MODELS, THEORETICAL ; PULMONARY ALVEOLI/*PATHOLOGY
MH - PULMONARY EMPHYSEMA/*PATHOLOGY ; RESPIRATION
LA - ENG
SO - ARCH PATHOL NOV 71;92(5):364-91

29 AU - RATLIFF JL ; FLETCHER JR ; KOPRIVA CJ ; ATKINS C ; AUSSEM JW
TI - PULMONARY CONTUSION. A CONTINUING MANAGEMENT PROBLEM.
MH - ADULT ; BLAST INJURIES/THERAPY ; CONTUSIONS/*THERAPY/SURGERY
MH - HEMOPTYSIS/DIAGNOSIS ; HUMAN ; LUNG/*INJURIES ; MALE
MH - *MILITARY MEDICINE ; OXYGEN INHALATION THERAPY ; REST ; VIETNAM
MH - WOUNDS, GUNSHOT/THERAPY
LA - ENG
SO - J THORAC CARDIOVASC SURG OCT 71;62(4):638-44

* * * * E N D O F O F F L I N E P R I N T * * * * * *

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1 AU - SKOTT HR ; FELL RB ; KERTZER R
TI - A MULTICHANNEL TELEMETRY SYSTEM FOR USE IN EXERCISE PHYSIOLOGY.
MH - *ELECTROCARDIOGRAPHY ; EXERTION ; HEART RATE ; HUMAN
MH - LUNG/PHYSIOLOGY ; MODELS, THEORETICAL ; RESPIRATION
MH - SPORTS MEDICINE ; TELEMETRY/*INSTRUMENTATION
LA - ENG
SO - IEEE TRANS BIOMED ENG OCT 70;17(4):339-46

2 AU - JOHNSON RF JR ; ZIEMER PL
TI - THE DEPOSITION AND RETENTION OF INHALED 152-154EUROPIUM OXIDE IN THE RAT.
MH - AEROSOLS ; ANIMAL ; BONE AND BONES/METABOLISM
MH - EUROPIUM/ANALYSIS/BLOOD/*METABOLISM ; FECES/ANALYSIS
MH - GASTROINTESTINAL SYSTEM/METABOLISM ; KIDNEY/METABOLISM
MH - LIVER/METABOLISM ; LUNG/METABOLISM ; MALE ; MODELS, THEORETICAL
MH - NASAL MUCOSA/METABOLISM ; OXIDES ; RADIOISOTOPES ; RATS
MH - *RESPIRATION
LA - ENG
SO - HEALTH PHYS FEB 71:20(2):187-93

3 AU - CHVOJKA Z
TI - PRECISION OF THE MATHEMATICAL AND GRAPHICAL CORRECTIONS TO THE DEPTH DOSAGE CURVE FOR THE ABSORPTION OF AIRY TISSUE
MH - ABSORPTION ; LUNG/*RADIATION EFFECTS ; MODELS, THEORETICAL
MH - *RADIATION EFFECTS ; *RADIOTHERAPY DOSAGE
LA - GER
SO - SB VED PR LEK FAK KARLOVY UNIV SUPPL 1969;12(3):267-70

*4 AU - CUMMING G ; HARDING K ; HORSFIELD K ; PRESTON S
TI - GAS DIFFUSION IN THE LUNG.
MH - CARBON DIOXIDE/METABOLISM ; DIFFUSION ; LUNG/*PHYSIOLOGY
MH - *MODELS, THEORETICAL ; OXYGEN CONSUMPTION ; RESPIRATORY DEAD SPACE
LA - ENG
SO - CLIN SCI MAR 70;38(3):19P

5 AU - BACHMAN L ; EGER EI 2D ; WAUD BE ; WAUD DR
TI - MAC AND DOSE-RESPONSE CURVES.
MH - ADULT
MH - ANESTHESIA, GENERAL/ADMINISTRATION & DOSAGE/PHARMACODYNAMICS *ANALYSIS ; *ANESTHESIA, INHALATION ; CHILD ; HUMAN ; METHODS
MH - MODELS, THEORETICAL ; PULMONARY ALVEOLI/*ANALYSIS
MH - *UNCONSCIOUSNESS
LA - ENG
SO - ANESTHESIOLOGY FEB 71:34(2):201-4

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6 AU - KOLCHINSKAIA AZ
TI - RESPIRATORY CONTROL IN CHILDREN AND ADOLESCENTS
MH - ADOLESCENCE ; ADULT ; AGE FACTORS ; CHILD ; ENGLISH ABSTRACT
MH - EXERTION ; FEMALE ; HUMAN ; LUNG/*GROWTH & DEVELOPMENT ; MALE
MH - MIDDLE AGE ; MODELS, THEORETICAL ; *OXYGEN CONSUMPTION
MH - PULMONARY CIRCULATION ; *RESPIRATION ; RESPIRATORY FUNCTION TESTS
MH - VENTILATION-PERFUSION RATIO
LA - UKR
SO - FIZIOL ZH MAR-APR 70;16(2):237-49

7 AU - MUNSON ES ; EGER EI 2D
TI - THE EFFECTS OF HYPERTHERMIA AND HYPOTHERMIA ON THE RATE OF OF INDUCTION OF ANESTHESIA: CALCULATIONS USING A MATHEMATICAL MODEL.
MH - ADIPOSE TISSUE/METABOLISM ; *ANESTHESIA ; ANESTHETICS/*METABOLISM
MH - BRAIN/METABOLISM ; BRAIN CHEMISTRY ; CARDIAC OUTPUT
MH - CYCLOPROPANES/METABOLISM ; ETHERS/METABOLISM ; FEVER/*METABOLISM
MH - FLUORINE/METABOLISM ; HALOTHANE/ANALYSIS/METABOLISM
MH - HYPOTHERMIA/*METABOLISM ; KIDNEY/METABOLISM ; LIVER/METABOLISM
MH - MATHEMATICS ; METHOXYFLURANE/METABOLISM ; *MODELS, THEORETICAL
MH - MUSCLES/METABOLISM ; MYOCARDIUM/METABOLISM ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/ANALYSIS
LA - ENG
SO - ANESTHESIOLOGY NOV 70;33(5):515-9

8 AU - KLIMENT V ; LIBICH J ; EDL J
TI - A MATHEMATICAL MODEL OF IN VITRO SURVIVAL OF GUINEA PIG ALVEOLAR MACROPHAGES IN CORRELATION TO TIME.
MH - ANIMAL ; GUINEA PIGS ; *MACROPHAGES ; METHODS
MH - *MODELS, THEORETICAL ; PULMONARY ALVEOLI/*CYTOLOGY ; TIME FACTORS
MH - TISSUE CULTURE
LA - ENG
SO - FOLIA MORPHOL (PRAHA) 1970:18(4):330-4

9 AU - ROGERS RT
TI - A PHANTOM MATERIAL TO REPRESENT LUNGS.
MH - DENSITOMETRY, X-RAY ; *LUNG ; *MODELS, THEORETICAL ; PLASTICS
MH - RADIOTHERAPY DOSAGE ; SPECIFIC GRAVITY
LA - ENG
SO - BR J RADIOL JUL 70;43(511):441-4

10 AU - JACKSON SM
TI - THE CLINICAL APPLICATION OF ELECTRON BEAM THERAPY WITH ENERGIES UP TO 10 MEV.
MH - BREAST NEOPLASMS/RADIOTHERAPY ; *ELECTRONS ; FEMALE ; HUMAN
MH - LUNG/RADIATION EFFECTS ; MASTECTOMY ; MODELS, THEORETICAL
MH - PULMONARY FIBROSIS/ETIOLOGY ; *RADIOTHERAPY ; RADIOTHERAPY DOSAGE
MH - SKIN DISEASES/RADIOTHERAPY ; SKIN NEOPLASMS/RADIOTHERAPY ; THORAX
LA - ENG
SO - BR J RADIOL JUL 70;43(511):431-40

11 AU - YOUNG ME ; GAYLORD JD
TI - EXPERIMENTAL TESTS OF CORRECTIONS FOR TISSUE INHOMOGENEITIES IN RADIOTHERAPY.
MH - ACRYLIC RESINS ; AIR ; ALUMINUM ; CARBON ; COBALT ISOTOPES
MH - ELECTRONS ; LUNG ; MATHEMATICS ; MODELS, THEORETICAL ; PLASTICS
MH - *RADIOTHERAPY DOSAGE ; *RADIOTHERAPY, HIGH ENERGY ; WOOD
LA - ENG
SO - BR J RADIOL MAY 70;43(509):349-55

12 AU - ARTHUR RM ; GESELOWITZ DB
TI - EFFECT OF INHOMOGENEITIES ON THE APPARENT LOCATION AND MAGNITUDE OF A CARDIAC CURRENT DIPOLE SOURCE.
MH - BLOOD VOLUME ; *ELECTRONICS, MEDICAL ; *ELECTROPHYSIOLOGY
MH - HEART/*PHYSIOLOGY ; HUMAN ; LUNG/PHYSIOLOGY ; MATHEMATICS
MH - MODELS, THEORETICAL
LA - ENG
SO - IEEE TRANS BIOMED ENG APR 70;17(2):141-6

13 AU - HULLER T ; BAZINI Y
TI - BLAST INJURIES OF THE CHEST AND ABDOMEN.
MH - ABDOMINAL INJURIES/*ETIOLOGY ; ADULT ; *BLAST INJURIES
MH - ELECTROCARDIOGRAPHY ; HEART INJURIES/ETIOLOGY ; HUMAN
MH - LUNG/INJURIES ; MALE ; NAVAL MEDICINE
MH - THORACIC INJURIES/*ETIOLOGY
LA - ENG
SO - ARCH SURG JAN 70;100(1):24-30

*14 AU - PEDLEY TJ ; SCHROTER RC ; SUDLOW MF
TI - PRESSURE FLOW RELATIONS IN BRANCHED TUBES.
MH - BRONCHI/PHYSIOLOGY ; MATHEMATICS ; MODELS, THEORETICAL ; *PRESSURE
MH - *RHEOLOGY
LA - ENG
SO - J PHYSIOL (LOND) OCT 69;204(2):114P+

15 AU - STUART BO ; DIONNE PJ
TI - DYNAMIC SIMULATION OF RETENTION AND TRANSLOCATION OF INHALED PLUTONIUM OXIDE IN BEAGLE DOGS. BNWL-714.
MH - AEROSOLS ; ANIMAL ; *COMPUTERS, ANALOG ; DOGS
MH - LUNG/RADIATION EFFECTS/*METABOLISM ; MODELS, BIOLOGICAL
MH - *MODELS, THEORETICAL ; PLUTONIUM/*METABOLISM ; TIME FACTORS
LA - ENG
SO - US AEC BATTELLE MEM INST PAC NORTHWEST LAB MAY 68;:3.5-3+

*16 AU - FRY DL
TI - A PRELIMINARY LUNG MODEL FOR SIMULATING THE AERODYNAMICS OF THE BRONCHIAL TREE.
MH - BRONCHI/*PHYSIOLOGY ; ELASTICITY ; LUNG/*PHYSIOLOGY
MH - LUNG COMPLIANCE ; MODELS, STRUCTURAL ; *MODELS, THEORETICAL
LA - ENG
SO - COMPUT BIOMED RES OCT 68;2(2):111-34

17 AU - RATTENBORG CC ; HOLADAY DA
TI - CONSTANT FLOW INFLATION OF THE LUNGS. THEORETICAL ANALYSIS.
MH - AIR ; ANIMAL ; BIOMECHANICS ; DOGS ; ELASTICITY ; ELECTRICITY
MH - LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL ; *RESPIRATION
MH - RESPIRATORY SYSTEM/*PHYSIOLOGY ; SPIROMETRY ; VISCOSITY
LA - ENG
SO - ACTA ANAESTHESIOL SCAND 1966;:SUPPL 23:211+

18 AU - MATSUURA T
TI - EMERGENCY TREATMENT OF THE CHEST WALL (INCLUDING THE PLEURA) AND LUNG INJURIES
MH - BLAST INJURIES/THERAPY ; BRONCHI/INJURIES ; *FIRST AID ; HUMAN
MH - LUNG/*INJURIES ; RIB FRACTURES/*THERAPY ; SHOCK, TRAUMATIC/THERAPY
MH - THORACIC INJURIES/*THERAPY ; TRACHEA/INJURIES
LA - JPN
SO - SURG THER (OSAKA) OCT 68;19(5):609-18

19 AU - BAYLEY RH ; KALBFLEISCH JM ; BERRY PM
TI - CHANGES IN THE BODY'S QRS SURFACE POTENTIALS PRODUCED BY ALTERATIONS IN CERTAIN COMPARTMENTS OF THE NONHOMOGENEOUS CONDUCTING MODEL.
MH - COMPUTERS ; COMPUTERS, HYBRID ; *ELECTROCARDIOGRAPHY
MH - HEART CONDUCTION SYSTEM/*PHYSIOLOGY ; HEMATOCRIT ; LUNG/PHYSIOLOGY
MH - *MODELS, THEORETICAL ; PERICARDIUM/PHYSIOLOGY ; POTENTIOMETRY
MH - THORAX/PHYSIOLOGY
LA - ENG
SO - AM HEART J APR 69;77(4):517-28

20 AU - DORSON W JR ; BAKER E ; COHEN ML ; MEYER B ; MOLTHAN M ; TRUMP D
AU - ELGAS R
TI - A PERFUSION SYSTEM FOR INFANTS.
MH - ANIMAL ; *ARTIFICIAL ORGANS ; BIOMEDICAL ENGINEERING ; DOGS
MH - EXTRACORPOREAL CIRCULATION/*INSTRUMENTATION ; HUMAN
MH - HYALINE MEMBRANE DISEASE/THERAPY ; *LUNG ; MODELS, THEORETICAL
MH - OXYGEN/*BLOOD ; RESPIRATORY DISTRESS SYNDROME/THERAPY
MH - TERMINAL CARE ; TIME FACTORS
LA - ENG
SO - TRANS AM SOC ARTIF INTERN ORGANS 1969;15:155-60

21 AU - SHEEHAN RM
TI - A "SLUICE" MODEL OF THE CIRCULATION IN LUNGS WITH SHUNTS.
MH - BLOOD FLOW VELOCITY ; COMPUTERS ; GRAVITATION
MH - *MODELS, BIOLOGICAL ; MODELS, THEORETICAL ; PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY ; *PULMONARY CIRCULATION
MH - VASCULAR RESISTANCE
LA - ENG
SO - COMPUT BIOMED RES JUN 69;2(4):385-410

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22 AU - WEST JB
TI - EFFECTS OF VENTILATION-PERFUSION INEQUALITY ON OVER-ALL GAS EXCHANGE STUDIED IN COMPUTER MODELS OF THE LUNG.
MH - CARBON DIOXIDE/BLOOD ; *COMPUTERS ; LUNG/PHYSIOLOGY
MH - *MODELS, THEORETICAL ; OXYGEN/BLOOD ; PULMONARY CIRCULATION
MH - *RESPIRATORY FUNCTION TESTS ; VENTILATION-PERFUSION RATIO
LA - ENG
SO - J PHYSIOL (LOND) JUN 69;202(2):116P+

23 AU - KIRBY RR ; DIGIOVANNI AJ ; BANCROFT RW ; MCIVER RG
TI - FUNCTION OF THE BIRD RESPIRATOR AT HIGH ALTITUDE.
MH - ACID-BASE EQUILIBRIUM ; *ALTITUDE ; ANIMAL ; APNEA/THERAPY
MH - *ATMOSPHERIC PRESSURE ; *AEROSPACE MEDICINE
MH - BIOMEDICAL ENGINEERING ; CARBON DIOXIDE/BLOOD ; DOGS ; EMERGENCIES
MH - HUMAN ; LUNG/PHYSIOLOGY ; MODELS, THEORETICAL ; OXYGEN/BLOOD
MH - *RESPIRATION ; *RESPIRATORS ; SPIROMETRY
LA - ENG
SO - AEROSP MED MAY 69;40(5):463-9

24 AU - SLEEMAN HK ; SIMMONS RL ; HEISTERKAMP CA 3D
TI - SERUM ENZYMES IN COMBAT CASUALTIES.
MH - ABDOMINAL INJURIES/ENZYMOLOGY ; ALANINE AMINOTRANSFERASE/*BLOOD
MH - ASPARTATE AMINOTRANSFERASE/*BLOOD ; BLAST INJURIES/ENZYMOLOGY
MH - BLOOD TRANSFUSION ; ENZYME TESTS ; EXTREMITIES/INJURIES
MH - FOOT/INJURIES ; HUMAN ; LACTATE DEHYDROGENASE/*BLOOD
MH - LIVER/INJURIES ; LUNG/INJURIES ; MALE ; *MILITARY MEDICINE
MH - SHOCK, HEMORRHAGIC/ENZYMOLOGY ; SHOCK, TRAUMATIC/ENZYMOLOGY
MH - THORACIC INJURIES/ENZYMOLOGY ; TIME FACTORS
MH - WOUNDS AND INJURIES/*ENZYMOLOGY
LA - ENG
SO - ARCH SURG MAR 69;98(3):272-4

25 AU - DEAN PN ; LANGHAM WH
TI - TUMORIGENICITY OF SMALL HIGHLY RADIOACTIVE PARTICLES.
MH - AEROSOLS ; ANIMAL ; HUMAN ; LUNG/RADIATION EFFECTS
MH - LUNG NEOPLASMS/ETIOLOGY ; MODELS, THEORETICAL ; MONKEYS
MH - NEOPLASMS, EXPERIMENTAL/ETIOLOGY ; *NEOPLASMS, RADIATION-INDUCED
MH - PLUTONIUM ; *RADIATION EFFECTS ; *RADIOISOTOPES ; RATS
MH - SKIN/*RADIATION EFFECTS ; SKIN NEOPLASMS/ETIOLOGY ; URANIUM
LA - ENG
SO - HEALTH PHYS JAN 69;16(1):79-84

26 AU - SPRING E ; ANTTILA P
TI - EMPIRICAL FORMULAS FOR TISSUE CORRECTION FACTORS IN COBALT TELETHERAPY.
MH - COBALT ISOTOPES/THERAPEUTIC USE ; LUNG/*RADIATION EFFECTS
MH - *MATHEMATICS ; MODELS, THEORETICAL ; *RADIOISOTOPE TELETHERAPY
MH - *RADIOTHERAPY DOSAGE
LA - ENG
SO - ACTA RADIOL THER (STOCKH) JUN 69;7(3):230-7

27 AU - DORSON W JR ; BAKER E ; HULL H
TI - A SHELL AND TUBE OXYGENATOR.
MH - ANIMAL ; *ARTIFICIAL ORGANS ; BIOMEDICAL ENGINEERING ; BIOPHYSICS
MH - CARBON DIOXIDE/BLOOD ; DOGS ; EXTRACORPOREAL CIRCULATION ; HUMAN
MH - *LUNG ; *MEMBRANES, ARTIFICIAL ; MODELS, THEORETICAL
MH - OXYGEN/*BLOOD ; RESPIRATION ; SILICONES
LA - ENG
SO - TRANS AM SOC ARTIF INTERN ORGANS 1968;14:242-9

28 AU - DUBOIS AB ; ROGERS RM
TI - RESPIRATORY FACTORS DETERMINING THE TISSUE CONCENTRATIONS OF INHALED TOXIC SUBSTANCES.
MH - BRONCHI/*ANATOMY & HISTOLOGY/*METABOLISM
MH - BRONCHIAL ARTERIES/PHYSIOLOGY ; DIFFUSION ; EPITHELIUM
MH - *MODELS, THEORETICAL ; OXYGEN ; OXYGEN CONSUMPTION
MH - PARTIAL PRESSURE ; PULMONARY ALVEOLI ; PULMONARY ARTERY/PHYSIOLOGY
MH - *RESPIRATION ; TRICHLOROETHYLENE/*TOXICITY
LA - ENG
SO - RESPIR PHYSIOL JUN 68;5(1):34-52

29 AU - CHIANG ST
TI - A NOMOGRAM FOR VENOUS SHUNT (QS-QT) CALCULATION.
MH - HUMAN ; MODELS, THEORETICAL ; *PULMONARY ALVEOLI
MH - *PULMONARY CIRCULATION ; *RESPIRATION
LA - ENG
SO - THORAX SEP 68;23(5):563-5

30 AU - WOITOWITZ HJ ; BUCHHEIM FW ; WOITOWITZ R
TI - ON THE THEORY AND PRAXIS OF TOTAL BODY PLETHYSMOGRAPHY IN THE LUNG FUNCTION ANALYSIS
MH - FEMALE ; HUMAN ; MALE ; MODELS, THEORETICAL ; *PLETHYSMOGRAPHY
MH - PRESSURE ; PULMONARY ALVEOLI ; *SPIROMETRY ; THORAX
LA - GER
SO - PRAX PNEUMOL AUG 67;21(8):449-71

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1 AU - SELVESTER RH ; SOLOMON JC ; GILLESPIE TL
TI - DIGITAL COMPUTER MODEL OF A TOTAL BODY ELECTROCARDIOGRAPHIC SURFACE MAP. AN ADULT MALE-TORSO SIMULATION WITH LUNGS.
MH - *COMPUTERS ; *ELECTROCARDIOGRAPHY ; HUMAN ; LUNG ; MALE
MH - *MODELS, THEORETICAL
LA - ENG
SO - CIRCULATION OCT 68;38(4):684-90

2 AU - SIEGEL JH ; DEL GUERCIO LR
TI - PERIPHERAL AND CENTRAL FACTORS INFLUENCING THE PULMONARY COMPLICATIONS OF NONTHORACIC TRAUMA IN MAN.
MH - ANIMAL ; BLOOD CIRCULATION/PHYSIOLOGY ; DOGS
MH - EMBOLISM, FAT/PHYSIOPATHOLOGY ; HUMAN ; LUNG DISEASES/ETIOLOGY
MH - MODELS, THEORETICAL ; OXYGEN CONSUMPTION ; PULMONARY ALVEOLI
MH - PULMONARY CIRCULATION/PHYSIOLOGY ; RESPIRATION ; SHOCK/*ETIOLOGY
MH - SHOCK, HEMORRHAGIC/PHYSIOPATHOLOGY ; SHOCK, SEPTIC/PHYSIOPATHOLOGY
MH - VASCULAR RESISTANCE ; WOUNDS AND INJURIES/*COMPLICATIONS
LA - ENG
SO - J TRAUMA SEP 68;8(5):742-55

3 AU - PAVLIK I
TI - EFFECT OF TIDAL VOLUME ON THE PULMONARY DIFFUSION CAPACITY
MH - CARBON MONOXIDE/ANALYSIS ; HUMAN ; MODELS, THEORETICAL
MH - PULMONARY ALVEOLI/METABOLISM ; *RESPIRATION
MH - RESPIRATORY FUNCTION TESTS
LA - SLO
SO - BRATISL LEK LISTY APR 68;49(4):389-98

4 AU - BOREN HG
TI - PULMONARY RESPONSE TO INHALED CARBON: A MODEL OF LUNG INJURY.
MH - ANIMAL ; *CHARCOAL ; CILIA/PHYSIOLOGY
MH - FOREIGN BODIES/*PHYSIOPATHOLOGY ; GUINEA PIGS
MH - LUNG/*PHYSIOLOGY/PATHOLOGY ; LYMPHATIC SYSTEM/PHYSIOLOGY ; MALE
MH - MODELS, THEORETICAL ; MUCUS/PHYSIOLOGY ; PHAGOCYTOSIS/PHYSIOLOGY
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; RESPIRATION
MH - RESPIRATORY SYSTEM/PATHOLOGY
LA - ENG
SO - YALE J BIOL MED APR-JUN 68;40(5):364-93

5 AU - KILBURN KH
TI - THEORY AND MODELS FOR CELLULAR INJURY AND CLEARANCE FAILURE IN THE LUNG.
MH - CYTOLOGY ; FOREIGN BODIES ; FROGS ; LUNG DISEASES/*PHYSIOPATHOLOGY
MH - MODELS, THEORETICAL ; PHAGOCYTOSIS
MH - PULMONARY ALVEOLI/*PHYSIOPATHOLOGY
LA - ENG
SO - YALE J BIOL MED APR-JUN 68;40(5):339-51

6 AU - HERZOG H ; KELLER R ; MAURER W ; BAUMANN HR ; NADJAFI A
TI - DISTRIBUTION OF BRONCHIAL RESISTANCE IN OBSTRUCTIVE PULMONARY DISEASES AND IN DOGS WITH ARTIFICIALLY INDUCED TRACHEAL COLLAPSE.
MH - AGED ; ANIMAL ; ASTHMA/PHYSIOPATHOLOGY
MH - BRONCHI/*PHYSIOPATHOLOGY/PATHOLOGY/PHYSIOLOGY
MH - BRONCHIAL NEOPLASMS/PHYSIOPATHOLOGY ; BRONCHITIS/PHYSIOPATHOLOGY
MH - DOGS ; FEMALE ; GOITER, SUBSTERNAL/PHYSIOPATHOLOGY ; HUMAN
MH - LUNG DISEASES/*PHYSIOPATHOLOGY ; MALE ; MIDDLE AGE
MH - MODELS, THEORETICAL ; PLETHYSMOGRAPHY
MH - PULMONARY EMPHYSEMA/PHYSIOPATHOLOGY
MH - RESPIRATORY INSUFFICIENCY/*PHYSIOPATHOLOGY
MH - RESPIRATORY SYSTEM/PHYSIOLOGY ; SPIROMETRY
MH - TRACHEA/*PHYSIOPATHOLOGY
LA - ENG
SO - RESPIRATION 1968;25(5):381-94

*7 AU - FILLEY GF ; BIGELOW DB ; OLSON DE ; LACQUET LM
TI - PULMONARY GAS TRANSPORT. A MATHEMATICAL MODEL OF THE LUNG.
MH - CARBON MONOXIDE ; *MODELS, THEORETICAL ; PULMONARY ALVEOLI
MH - RESPIRATION ; RESPIRATORY SYSTEM/*PHYSIOLOGY
LA - ENG
SO - AM REV RESPIR DIS SEP 68;98(3):480-9

8 AU - SULLIVAN SF ; PAVIN MP
TI - OXYGEN TURNOVER RATE IN THE VENOUS RESERVOIR.
MH - ANESTHESIA, INTRAVENOUS ; ANIMAL ; ARTERIES ; BLOOD GAS ANALYSIS
MH - CARDIAC OUTPUT ; DOGS ; HYDROGEN-ION CONCENTRATION
MH - HYPERVENTILATION/*BLOOD ; MODELS, THEORETICAL ; OXYGEN/*BLOOD
MH - PENTOBARBITAL ; *PULMONARY ALVEOLI ; RESPIRATION/*PHYSIOLOGY
MH - *VEINS
LA - ENG
SO - BR J ANAESTH APR 68;40(4):227-32

*9 AU - ARCHIE JP JR
TI - AN ANALYTIC EVALUATION OF A MATHEMATICAL MODEL FOR THE EFFECT OF PULMONARY SURFACTANT ON RESPIRATORY MECHANICS.
MH - COMPUTERS ; HUMAN ; LUNG/PHYSIOLOGY ; *MODELS, THEORETICAL
MH - PRESSURE ; RESPIRATION/*PHYSIOLOGY ; SURFACE TENSION
LA - ENG
SO - DIS CHEST JUN 68;53(6):759-64

10 AU - ROSSING RG ; DANFORD MB ; BELL EL ; GARCIA R
TI - MATHEMATICAL MODELS FOR THE ANALYSIS OF THE NITROGEN WASHOUT CURVE. SAM-TR-67-100.
MH - ANIMAL ; COMPUTERS ; DOGS ; LUNG/*PHYSIOLOGY ; MATHEMATICS
MH - MODELS, THEORETICAL ; NITROGEN/*METABOLISM ; RESPIRATION
LA - ENG
SO - US AIR FORCE SCH AEROSP MED JUL 67;:1-55

11 AU - SHFCRE JR ; BROWN S ; MORGAN DC
TI - THE PULMONARY VENTILATORY FUNCTION OF COAL MINERS IN THE UNITED KINGDOM.
MH - ADOLESCENCE ; ADULT ; AGE FACTORS ; *COAL MINING
MH - ENVIRONMENTAL EXPOSURE ; GREAT BRITAIN ; HEALTH SURVEYS ; HUMAN
MH - LUNG/*PHYSIOLOGY ; MALE ; MIDDLE AGE ; MODELS, THEORETICAL
MH - PNEUMOCONIOSIS/*ETIOLOGY/OCCURRENCE/RADIOGRAPHY ; POSTURE
MH - RESPIRATORY INSUFFICIENCY ; SAMPLING STUDIES ; SMOKING
MH - SPIROMETRY
LA - ENG
SO - AM REV RESPIR DIS MAY 68;97(5):810-26

12 AU - WEIBEL ER
TI - A NOTE ON LUNG FIXATION.
MH - FORMALDEHYDE ; *HISTOLOGICAL TECHNICS ; HUMAN
MH - LUNG/*ANATOMY & HISTOLOGY ; METHODS ; MODELS, THEORETICAL
LA - ENG
SO - AM REV RESPIR DIS MAR 68;97(3):463-5

13 AU - YOUNG AC ; MARTIN CJ ; HASHIMOTO T
TI - CAN THE DISTRIBUTION OF INSPIRED GAS BE ALTERED?
MH - *COMPUTERS, ANALOG ; HUMAN ; LUNG/*PHYSIOLOGY
MH - MODELS, THEORETICAL ; NITROGEN ; OXYGEN
MH - POSITIVE PRESSURE RESPIRATION ; POSTURE
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; RESPIRATION/*PHYSIOLOGY
MH - RESPIRATORY TRACT DISEASES/PHYSIOPATHOLOGY
LA - ENG
SO - J APPL PHYSIOL FEB 68;24(2):129-34

14 AU - KUNO K ; STAUB NC
TI - ACUTE MECHANICAL EFFECTS OF LUNG VOLUME CHANGES ON ARTIFICIAL MICROHOLES IN ALVEOLAR WALLS.
MH - ANIMAL ; ATELECTASIS/ETIOLOGY ; CATS ; ELASTICITY ; METHODS
MH - MODELS, THEORETICAL ; PULMONARY ALVEOLI/*PHYSIOPATHOLOGY
MH - PULMONARY EMPHYSEMA/PHYSIOPATHOLOGY ; REGENERATION
MH - RESPIRATION/*PHYSIOLOGY ; RESPIRATORY FUNCTION TESTS
LA - ENG
SO - J APPL PHYSIOL JAN 68;24(1):83-92

15 AU - STELTER GP ; HANSEN JE ; FAIRCHILD DG
TI - A THREE-DIMENSIONAL RECONSTRUCTION OF LUNG PARENCHYMA.
MH - ANIMAL ; DOGS ; LUNG/*ANATOMY & HISTOLOGY ; MODELS, THEORETICAL
LA - ENG
SO - AM REV RESPIR DIS JUL 66;94(1):79-85

16 AU - DIACONESCU N ; VELEANU C
TI - THE ROLE OF THORACIC SPINE DYNAMICS IN LOBATION OF THE LUNG PARENCHYMA
MH - ANIMAL ; CATS ; CATTLE ; DOGS ; GUINEA PIGS ; HUMAN
MH - LUNG/*ANATOMY & HISTOLOGY ; MODELS, THEORETICAL ; RABBITS ; RATS
MH - THORACIC VERTEBRAE/*PHYSIOLOGY
LA - GER
SO - ANAT ANZ 31 AUG 65;117(2):96-108

17 AU - EVANS JA ; HAMILTON RW JR ; KUENZIG MC ; PELTIER LF
TI - EFFECTS OF ANESTHETIC AGENTS ON SURFACE PROPERTIES OF DIPALMITOYL LECITHIN: LUNG SURFACTANT MODEL.
MH - CHEMISTRY ; *ETHYL ETHERS ; *HALOTHANE ; *PHOSPHATIDYLCHOLINES
MH - LUNG ; *METHOXYFLURANE ; MODELS, THEORETICAL
MH - *SURFACE-ACTIVE AGENTS
LA - ENG
SO - ANESTH ANALG (CLEVE) MAY-JUN 66;45(3):265-9

18 AU - MULLIGAN JT ; BOUHUYS A
TI - MATHEMATICAL MODELS OF NONUNIFORM INTRAPULMONARY GAS DISTRIBUTION.
MH - BIOMETRY ; LUNG/*PHYSIOLOGY ; *MODELS, THEORETICAL ; *NITROGEN
LA - ENG
SO - BULL MATH BIOPHYS DEC 65;27(4):473-6

19 AU - BURGER R ; LOWENSTEIN JM
TI - ADENYLATE DEAMINASE. 3. REGULATION OF DEAMINATION PATHWAYS IN EXTRACTS OF RAT HEART AND LUNG.
MH - ADENOSINE TRIPHOSPHATE/PHARMACODYNAMICS ; *AMINOHYDROLASES
MH - ANIMAL ; DEPRESSION, CHEMICAL ; CHROMATOGRAPHY, GEL
MH - GUANINE NUCLEOTIDES/METABOLISM ; LUNG/*METABOLISM ; MALE
MH - MODELS, BIOLOGICAL ; MODELS, THEORETICAL ; MYOCARDIUM/*METABOLISM
MH - NUCLEOSIDES/METABOLISM ; PHOSPHORUS ISOTOPES ; RATS
MH - STIMULATION, CHEMICAL ; TRITIUM
LA - ENG
SO - J BIOL CHEM 25 NOV 67;242(22):5261-8

20 AU - SAFONOFF I ; EMMANUEL GE
TI - THE EFFECT OF PENDELLUFT AND DEAD SPACE ON NITROGEN CLEARANCE: MATHEMATICAL AND EXPERIMENTAL MODELS AND THEIR APPLICATION TO THE STUDY OF THE DISTRIBUTION OF VENTILATION.
MH - ADULT ; AGED ; HUMAN ; LUNG/*PHYSIOLOGY/PHYSIOPATHOLOGY
MH - LUNG DISEASES/PHYSIOPATHOLOGY ; MATHEMATICS ; MIDDLE AGE
MH - *MODELS, THEORETICAL ; NITROGEN/*METABOLISM
MH - RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - J CLIN INVEST OCT 67;46(10):1683-93

21 AU - HOLMA B
TI - LUNG CLEARANCE OF MONO- AND DI-DISPERSE AEROSOLS DETERMINED BY PROFILE SCANNING AND WHOLE-BODY COUNTING. A STUDY ON NORMAL AND SO2 EXPOSED RABBITS.
MH - *AEROSOLS ; ANIMAL ; GOLD ISOTOPES ; LUNG/DRUG EFFECTS/*PHYSIOLOGY
MH - MODELS, THEORETICAL ; PHAGOCYTOSIS ; POLYSTYRENES ; RABBITS
MH - *RADIONUCLIDE IMAGING/INSTRUMENTATION ; *RADIOMETRY
MH - SULFUR DIOXIDE/*PHARMACODYNAMICS
LA - ENG
SO - ACTA MED SCAND 1967;:SUPPL 473:1+

22 AU - MCFEE R ; RUSH S
TI - QUALITATIVE EFFECTS OF THORACIC RESISTIVITY VARIATIONS ON THE INTERPRETATION OF ELECTROCARDIOGRAMS: THE "BRODY" EFFECT.
MH - *ELECTROCARDIOGRAPHY ; HEART/*PHYSIOLOGY ; HEART SEPTUM/PHYSIOLOGY
MH - HUMAN ; LUNG/PHYSIOLOGY ; MATHEMATICS ; MODELS, THEORETICAL
MH - THORAX/*PHYSIOLOGY
LA - ENG
SO - AM HEART J NOV 67;74(5):642-51

●23 AU - HORSFIELD K ; CUMMING G
TI - ANGLES OF BRANCHING AND DIAMETERS OF BRANCHES IN THE HUMAN BRONCHIAL TREE.
MH - BRONCHI/*ANATOMY & HISTOLOGY/PHYSIOLOGY ; HUMAN ; MALE
MH - MATHEMATICS ; *MODELS, THEORETICAL
LA - ENG
SO - BULL MATH BIOPHYS JUN 67;29(2):245-59

24 AU - KIBBY PM
TI - A MATHEMATICAL MODEL FOR CO2 EXCHANGE DURING THE INITIAL STAGES OF REBREATHING.
MH - CARBON DIOXIDE/*BLOOD ; LUNG/PHYSIOLOGY ; MATHEMATICS
MH - *MODELS, THEORETICAL ; RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - RESPIR PHYSIOL OCT 67;3(2):243-55

25 AU - WILSON TA
TI - A THEORETICAL PREDICTION OF THE NORMAL CARDIAC OXYGEN CONSUMPTION.
MH - BIOPHYSICS ; BLOOD FLOW VELOCITY ; CARBON DIOXIDE/METABOLISM
MH - HUMAN ; LUNG/METABOLISM ; MODELS, THEORETICAL ; MUSCLES/METABOLISM
MH - MYOCARDIUM/*METABOLISM ; *OXYGEN CONSUMPTION ; *THERMODYNAMICS
LA - ENG
SO - BIOPHYS J SEP 67;7(5):585-94

●26 AU - KIEN GA ; FELLER FN
TI - SIMULATION OF BIOLOGIC SYSTEMS BY DIGITAL COMPUTER.
MH - ANESTHETICS/*METABOLISM ; BIOLOGICAL TRANSPORT/*PHYSIOLOGY
MH - *COMPUTERS ; HEART/PHYSIOLOGY ; HEMODYNAMICS ; HUMAN
MH - LUNG/BLOOD SUPPLY ; MATHEMATICS ; *MODELS, THEORETICAL
MH - REGIONAL BLOOD FLOW ; RESPIRATION/PHYSIOLOGY
LA - ENG
SO - ARCH PHYS MED REHABIL SEP 67;48(9):456-62

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27 AU - DELVIGS P ; TABORSKY RG
TI - THE METABOLISM OF
3-(2-ACETOXYETHYL)-5-METHOXYINDOLE(5-METHOXYTRYPTOPHOL O-ACETATE).
MH - ADRENAL GLANDS/ANALYSIS ; ANIMAL ; BRAIN CHEMISTRY
MH - CARBON ISOTOPES ; CHEMISTRY ; CHROMATOGRAPHY, PAPER ; FEMALE
MH - INDOLES/BLOOD/*METABOLISM/URINE ; KIDNEY/ANALYSIS ; LIVER/ANALYSIS
MH - LUNG/ANALYSIS ; MODELS, THEORETICAL ; MYOCARDIUM/ANALYSIS
MH - OVARY/ANALYSIS ; OXIDATION-REDUCTION ; PINEAL BODY/ANALYSIS ; RATS
MH - SPLEEN/ANALYSIS ; THYROID GLAND/ANALYSIS ; UTERUS/ANALYSIS
LA - ENG
SO - BIOCHEM PHARMACOL MAR 67;16(3):579-86

28 AU - MALONEY JE
TI - INSTRUMENTAL FACTORS AND THE MEASUREMENT OF PULMONARY FUNCTION
WITH XENON-133.
MH - HUMAN ; MODELS, THEORETICAL ; PULMONARY ALVEOLI/PHYSIOLOGY
MH - PULMONARY CIRCULATION/*PHYSIOLOGY
MH - RADIONUCLIDE IMAGING/*INSTRUMENTATION
MH - REGIONAL BLOOD FLOW/PHYSIOLOGY ; *RESPIRATORY FUNCTION TESTS
MH - STATISTICS ; *XENON
LA - ENG
SO - PHYS MED BIOL APR 67;12(2):161-72

29 AU - HAQUE AK ; COLLINSON AJ
TI - RADIATION DOSE TO THE RESPIRATORY SYSTEM DUE TO RADON AND ITS
DAUGHTER PRODUCTS.
MH - AEROSOLS ; *AIR POLLUTION, RADIOACTIVE ; ALPHA PARTICLES
MH - BRONCHI/RADIATION EFFECTS ; ENGLAND ; ENVIRONMENTAL EXPOSURE
MH - HUMAN ; MODELS, THEORETICAL ; *RADIATION EFFECTS ; RADIOMETRY
MH - *RADON ; RESPIRATORY SYSTEM/*RADIATION EFFECTS
MH - TRACHEA/RADIATION EFFECTS
LA - ENG
SO - HEALTH PHYS MAY 67;13(5):431-43

30 AU - HASHIMOTO T ; YOUNG AC ; MARTIN CJ
TI - COMPARTMENTAL ANALYSIS OF THE DISTRIBUTION OF GAS IN THE LUNGS.
MH - ADOLESCENCE ; ADULT ; AGED ; CARBON DIOXIDE/*PHYSIOLOGY ; CHILD
MH - COMPUTERS, ANALOG ; FEMALE ; HUMAN
MH - LUNG/*PHYSIOLOGY/*PHYSIOPATHOLOGY ; MALE ; MIDDLE AGE
MH - *MODELS, THEORETICAL ; NITROGEN/*PHYSIOLOGY ; OXYGEN/*PHYSIOLOGY
MH - PULMONARY ALVEOLI/PHYSIOPATHOLOGY
MH - PULMONARY EDEMA/PHYSIOPATHOLOGY
LA - ENG
SO - J APPL PHYSIOL AUG 67;23(2):203-9

●31 AU - JODAT RW ; MORGAN JD ; LANGE RL
TI - SIMULATION OF RESPIRATORY MECHANICS.
MH - BIOPHYSICS ; LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL
MH - RESPIRATION/*PHYSIOLOGY ; RESPIRATORY SYSTEM/*PHYSIOLOGY
LA - ENG
SO - BIOPHYS J NOV 66;6(6):773-85

32 AU - EDWARDS AW
TI - THEORY OF AN INERT GAS METHOD FOR REGIONAL PULMONARY BLOOD FLOW IN BRONCHOSPIROMETRY.
MH - BIOLOGICAL TRANSPORT ; BLOOD FLOW VELOCITY ; BLOOD GAS ANALYSIS
MH - *BRONCHOSPIROMETRY ; CAPILLARIES/PHYSIOLOGY ; LUNG/*PHYSIOLOGY
MH - MODELS, THEORETICAL ; OXYGEN CONSUMPTION
MH - PULMONARY CIRCULATION/*PHYSIOLOGY ; *REGIONAL BLOOD FLOW
LA - ENG
SO - RESPIR PHYSIOL DEC 66;2(1):22-35

●33 AU - SUWA N ; FUKASAWA H ; FUJIMOTO R ; KAWAKAMI M
TI - STRAIN AND STRESS OF PULMONARY TISSUES.
MH - AORTA ; BIOPHYSICS ; *ELASTICITY ; LUNG/*PHYSIOLOGY
MH - *MODELS, THEORETICAL ; PLEURA/*PHYSIOLOGY ; SKIN ; *STRESS
LA - ENG
SO - TOHOKU J EXP MED SEP 66;90(1):61-75

34 AU - MELDOLESI U ; MARTINENGHI C ; TAROLO GL
TI - PULMONARY REGIONAL BLOOD-FLOW AS EVALUATED BY MEANS OF I-131 TAGGED MACROAGGREGATED ALBUMIN (MAA-I-131).
MH - *BLOOD FLOW VELOCITY ; HUMAN ; LUNG/*BLOOD SUPPLY
MH - LUNG DISEASES/DIAGNOSIS ; MACROMOLECULAR SYSTEMS
MH - MODELS, THEORETICAL ; *RADIONUCLIDE IMAGING
LA - ENG
SO - STRAHLENTHERAPIE SONDERB 1967;65:197-207

35 AU - MITTMAN C
TI - NONUNIFORM PULMONARY DIFFUSING CAPACITY MEASURED BY SEQUENTIAL CO UPTAKE AND WASHOUT.
MH - CARBON MONOXIDE/*METABOLISM ; COMPUTERS ; LUNG/*PHYSIOLOGY
MH - MODELS, THEORETICAL ; RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - J APPL PHYSIOL JUL 67;23(1):131-8

36 AU - SAKLAD M ; WICKLIFF D
TI - FUNCTIONAL CHARACTERISTICS OF ARTIFICIAL VENTILATORS.
MH - BRONCHOSPIROMETRY ; LUNG ; MODELS, THEORETICAL ; *RESPIRATORS
LA - ENG
SO - ANESTHESIOLOGY JUL-AUG 67;28(4):716-22

37 AU - SAKLAD M ; PALIOTTA J
TI - TRANS-ENDOTRACHEAL TUBE SUCTION IN THE SIMULATED BREATHING PATIENT.
MH - *ANESTHESIA, INTRATRACHEAL ; ATMOSPHERIC PRESSURE
MH - CATHETERIZATION ; FOREIGN BODIES ; INTUBATION, INTRATRACHEAL
MH - LUNG ; MODELS, THEORETICAL ; RESPIRATION/PHYSIOLOGY
MH - RESPIRATORY SYSTEM/PHYSIOLOGY
LA - ENG
SO - ANESTHESIOLOGY JUL-AUG 67;28(4):652-60

38 AU - KELMAN GR
TI - CALCULATION OF CERTAIN INDICES OF CARDIO-PULMONARY FUNCTION, USING A DIGITAL COMPUTER.
MH - ACID-BASE EQUILIBRIUM ; *BLOOD GAS ANALYSIS
MH - CARBON DIOXIDE/*BLOOD/PHYSIOLOGY ; *CARDIAC OUTPUT
MH - CHEMISTRY, CLINICAL ; *COMPUTERS ; HUMAN
MH - HYDROGEN-ION CONCENTRATION ; MODELS, THEORETICAL
MH - OXYGEN/PHYSIOLOGY/*BLOOD ; OXYGEN CONSUMPTION ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; PULMONARY VEINS
MH - RESPIRATORY SYSTEM/*PHYSIOLOGY
LA - ENG
SO - RESPIR PHYSIOL 1966;1(3):335-43

39 AU - LEWIS BM ; BURK B
TI - AN ANALOG COMPUTER ANALYSIS OF REGIONAL DIFFUSING CAPACITY IN AIRFLOW OBSTRUCTION.
MH - ACETYLENE/ANALYSIS ; ADULT ; AGED ; ASTHMA/PHYSIOPATHOLOGY
MH - CARBON MONOXIDE/ANALYSIS ; *COMPUTERS, ANALOG ; FEMALE ; HUMAN
MH - LUNG/*PHYSIOPATHOLOGY ; MALE ; MIDDLE AGE ; MODELS, THEORETICAL
MH - NEON/ANALYSIS ; PULMONARY EMPHYSEMA/PHYSIOPATHOLOGY
MH - *RESPIRATORY FUNCTION TESTS
MH - RESPIRATORY INSUFFICIENCY/*PHYSIOPATHOLOGY
MH - SCHEUERMANN'S DISEASE/PHYSIOPATHOLOGY
LA - ENG
SO - J APPL PHYSIOL JUN 67;22(6):1127-42

40 AU - MANKTELOW BW
TI - THE LOSS OF PULMONARY SURFACTANT IN PARAQUAT POISONING: A MODEL FOR THE STUDY OF THE RESPIRATORY DISTRESS SYNDROME.
MH - ANIMAL ; HERBICIDES/*POISONING ; LIPOPROTEINS/ANALYSIS
MH - LUNG/*DRUG EFFECTS/PATHOLOGY ; MICE ; MODELS, THEORETICAL
MH - PULMONARY ALVEOLI/*PATHOLOGY ; PYRIDINES/*POISONING
MH - *RESPIRATORY DISTRESS SYNDROME
LA - ENG
SO - BR J EXP PATHOL JUN 67;48(3):266-9

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41 AU - GILBERT R ; AUCHINCLOSS JH JR ; BAULE GH
TI - METABOLIC AND CIRCULATORY ADJUSTMENTS TO UNSTEADY-STATE EXERCISE.
MH - ADULT ; CARDIAC OUTPUT/PHYSIOLOGY
MH - CELL MEMBRANE PERMEABILITY/PHYSIOLOGY ; *EXERTION ; FEMALE ; HUMAN
MH - MALE ; MODELS, THEORETICAL ; *OXYGEN CONSUMPTION
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; PULMONARY CIRCULATION/*PHYSIOLOGY
MH - RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - J APPL PHYSIOL MAY 67;22(5):905-12

42 AU - PAULEV PE
TI - NITROGEN TISSUE TENSIONS FOLLOWING REPEATED BREATH-HOLD DIVES.
MH - COMPUTERS ; *DECOMPRESSION SICKNESS ; *DIVING
MH - MODELS, THEORETICAL ; NITROGEN/*METABOLISM
MH - PULMONARY ALVEOLI/*METABOLISM ; RESPIRATION/PHYSIOLOGY
LA - ENG
SO - J APPL PHYSIOL APR 67;22(4):714-6

43 AU - DE VILLIERS AJ ; GROSS P
TI - MORPHOLOGIC CHANGES INDUCED IN THE LUNGS OF HAMSTERS AND RATS BY EXTERNAL RADIATION (X-RAYS). A STUDY IN EXPERIMENTAL CARCINOGENESIS.
MH - ADENOMA/PATHOLOGY ; ANIMAL ; CARCINOMA, EPIDERMOID/PATHOLOGY
MH - HAMSTERS ; LUNG/*RADIATION EFFECTS ; LUNG NEOPLASMS/*ETIOLOGY
MH - MODELS, THEORETICAL ; NEOPLASMS, EXPERIMENTAL/PATHOLOGY
MH - NEOPLASMS, RADIATION-INDUCED/*PATHOLOGY
MH - PULMONARY ALVEOLI/RADIATION EFFECTS ; *RADIATION EFFECTS ; RATS
LA - ENG
SO - CANCER OCT 66;19(10):1399-410

●44 AU - VARENE P ; TIMBAL J ; JACQUEMIN C
TI - EFFECT OF DIFFERENT AMBIENT PRESSURES ON AIRWAY RESISTANCE.
MH - *ALTITUDE ; *ATMOSPHERIC PRESSURE ; BRONCHI/PHYSIOLOGY ; *DIVING
MH - LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL ; PLETHYSMOGRAPHY
MH - PULMONARY CIRCULATION/PHYSIOLOGY ; RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - J APPL PHYSIOL APR 67;22(4):699-706

●45 AU - KING TK ; BRISCOE WA
TI - BOHR INTEGRAL ISOPLETHS IN THE STUDY OF BLOOD GAS EXCHANGE IN THE LUNG.
MH - CAPILLARIES ; CARBON DIOXIDE/BLOOD ; HEMOGLOBINS/PHYSIOLOGY
MH - HUMAN ; HYDROGEN-ION CONCENTRATION
MH - LUNG/*BLOOD SUPPLY/*PHYSIOLOGY ; MODELS, THEORETICAL ; OXIMETRY
MH - OXYGEN/*BLOOD ; *OXYGEN CONSUMPTION ; PLETHYSMOGRAPHY
MH - PULMONARY CIRCULATION ; *REGIONAL BLOOD FLOW
LA - ENG
SO - J APPL PHYSIOL APR 67;22(4):659-74

46 AU - PRYS-ROBERTS C ; KELMAN GR ; GREENBAUM R
TI - THE INFLUENCE OF CIRCULATORY FACTORS ON ARTERIAL OXYGENATION DURING ANAESTHESIA IN MAN.
MH - ADULT ; AGED ; *ANESTHESIA, INHALATION ; BLOOD PRESSURE
MH - *CARDIAC OUTPUT ; FEMALE ; HEART RATE ; HUMAN ; MALE ; MIDDLE AGE
MH - MODELS, THEORETICAL ; NITROUS OXIDE/PHARMACODYNAMICS ; OXIMETRY
MH - OXYGEN/*BLOOD ; PULMONARY ALVEOLI/PHYSIOLOGY
MH - THIOPENTAL/PHARMACODYNAMICS
LA - ENG
SO - ANAESTHESIA APR 67;22(2):257-75

47 AU - BUCHER K
TI - INCREASE OF ELASTICITY OF THE LUNG BY DRUGS. A POSSIBILITY FOR IMPROVEMENT OF EXPIRATORY DYSPNEA
MH - ACETYLCHOLINE ; ANIMAL ; DYSPNEA/*DRUG THERAPY
MH - ELASTICITY/*DRUG EFFECTS ; EPINEPHRINE/*PHARMACODYNAMICS ; FEMALE
MH - HISTAMINE ; ISOPROTERENOL/*PHARMACODYNAMICS ; LUNG/*DRUG EFFECTS
MH - MALE ; MODELS, THEORETICAL ; NOREPINEPHRINE/*PHARMACODYNAMICS
MH - RABBITS
LA - GER
SO - ARZNEIM FORSCH DEC 65;15(12):1371-5

48 AU - PATEL DJ ; JANICKI JS
TI - CATALOGUE OF SOME DYNAMIC ANALOGIES USED IN PULMONARY AND VASCULAR MECHANICS.
MH - BLOOD CIRCULATION/*PHYSIOLOGY ; BLOOD VESSELS/*PHYSIOLOGY
MH - LUNG/*PHYSIOLOGY ; *MODELS, THEORETICAL ; MOVEMENT
LA - ENG
SO - MED RES ENG 1966;5(4):30-3

49 AU - STONE HH ; REAME DW ; CORBITT JD ; GIVEN KS ; MARTIN JD JR
TI - RESPIRATORY BURNS: A CORRELATION OF CLINICAL AND LABORATORY RESULTS.
MH - ADOLESCENCE ; ADULT ; AGED ; ALDOSTERONE/THERAPEUTIC USE ; ANIMAL
MH - BURNS/COMPLICATIONS/*THERAPY/DRUG THERAPY/PATHOLOGY ; CHILD
MH - CHILD, PRESCHOOL ; FEMALE ; HUMAN ; HUMIDITY ; INFANT
MH - LUNG/*INJURIES ; MALE ; MIDDLE AGE ; MODELS, THEORETICAL
MH - OXYGEN INHALATION THERAPY ; PNEUMONIA/ETIOLOGY
MH - PULMONARY EDEMA/ETIOLOGY ; RATS
MH - RESPIRATORY INSUFFICIENCY/ETIOLOGY
MH - SURFACE-ACTIVE AGENTS/THERAPEUTIC USE ; TEMPERATURE ; TRACHEOTOMY
LA - ENG
SO - ANN SURG FEB 67;165(2):157-68

50 AU - FRANK NR ; YODER RE
TI - A METHOD OF MAKING A FLEXIBLE CAST OF THE LUNG.
MH - ANIMAL ; CATS ; LUNG/*ANATOMY & HISTOLOGY ; *MODELS, THEORETICAL
MH - POLYMERS
LA - ENG
SO - J APPL PHYSIOL NOV 66;21(6):1925-6

51 AU - STELTER GP ; HANSEN JE
TI - COMPARISON OF THE DIRECT AND INDIRECT METHODS OF CALCULATING THE SURFACE AREA OF THE LUNG.
MH - LUNG/*ANATOMY & HISTOLOGY ; MATHEMATICS ; *MODELS, THEORETICAL
LA - ENG
SO - AM REV RESPIR DIS NOV 66;94(5):741-2

52 AU - READ J
TI - STRATIFICATION OF VENTILATION AND BLOOD FLOW IN THE NORMAL LUNG.
MH - ADULT ; ARGON ; CARBON DIOXIDE ; FEMALE ; HUMAN ; LUNG/*PHYSIOLOGY
MH - MALE ; MODELS, THEORETICAL ; NITROGEN ; OXYGEN ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY ; *PULMONARY CIRCULATION
LA - ENG
SO - J APPL PHYSIOL SEP 66;21(5):1521-31

53 AU - STONE RM ; GINSBERG RJ ; COLAPINTO RF ; PEARSON FG
TI - BRONCHIAL ARTERY REGENERATION AFTER RADICAL HILAR STRIPPING.
MH - ANIMAL ; BRONCHIAL ARTERIES/GROWTH & DEVELOPMENT ; BRONCHOSCOPY
MH - DOGS ; LUNG/*SURGERY ; MODELS, THEORETICAL ; PNEUMONECTOMY
MH - REGENERATION
LA - ENG
SO - SURG FORUM 1966;17:109-10

54 AU - NAVRATIL M ; EPPL L
TI - THE USE OF MODEL EXPERIMENTS IN PHYSIOPATHOLOGY. II. ANALYSIS OF THE DISTRIBUTION OF AIR IN THE LUNG AS COMPARED WITH A SIMPLY DEFINED SPACE
MH - ADULT ; HUMAN ; LUNG/*PHYSIOPATHOLOGY ; MIDDLE AGE
MH - *MODELS, THEORETICAL ; *RESPIRATION ; *SPIROMETRY
LA - CZE
SO - CAS LEK CESK 4 JUL 66;105(27):734-8

55 AU - SIKAND R ; CERRETELLI P ; FARHI LE
TI - EFFECTS OF VA AND VA/Q DISTRIBUTION AND OF TIME ON THE ALVEOLAR PLATEAU.
MH - ARGON ; CARBON DIOXIDE/*METABOLISM ; HUMAN ; MODELS, THEORETICAL
MH - NITROGEN ; OXYGEN/*METABOLISM ; PARTIAL PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY
LA - ENG
SO - J APPL PHYSIOL JUL 66;21(4):1331-7

56 AU - DOBROVOL'SKII GA
TI - METHODS OF ANATOMICAL EXAMINATION OF THE LUNGS WITH THE AID OF VARIOUS POLYMERIC MATERIALS
MH - LUNG/*ANATOMY & HISTOLOGY ; MODELS, THEORETICAL ; PLASTICS
MH - RUBBER
LA - RUS
SO - ARKH PATOL 1965;27(8):76-7

57 AU - ROSSO R ; PALMA V ; GARATTINI S
TI - A MODEL OF A CEREBRAL TUMOUR FOR STUDIES IN CANCER CHEMOTHERAPY.
MH - ANIMAL ; ANTINEOPLASTIC AGENTS/THERAPEUTIC USE ; BLOOD
MH - BRAIN NEOPLASMS/*DRUG THERAPY ; CARCINOMA 256, WALKER ; KIDNEY
MH - LIVER ; LUNG ; MODELS, THEORETICAL ; NEOPLASM TRANSPLANTATION
MH - NEOPLASMS, EXPERIMENTAL ; RATS ; SARCOMA, EXPERIMENTAL
MH - SARCOMA, OSTEOGENIC ; UTERINE NEOPLASMS
LA - ENG
SO - EXPERIENTIA 15 JAN 66;22(1):62-3

58 AU - GILBERT R ; PAULE GH ; AUCHINCLOSS JH JR
TI - THEORETICAL ASPECTS OF OXYGEN TRANSFER DURING EARLY EXERCISE.
MH - CAPILLARIES ; CARDIAC OUTPUT ; *EXERTION ; MATHEMATICS
MH - MODELS, THEORETICAL ; *OXYGEN CONSUMPTION
MH - PULMONARY ALVEOLI/*METABOLISM
LA - ENG
SO - J APPL PHYSIOL MAY 66;21(3):803-9

59 AU - PIIPER J ; SIKAND RS
TI - DETERMINATION OF D-CO BY THE SINGLE BREATH METHOD IN INHOMOGENEOUS LUNGS: THEORY.
MH - BIOMETRY ; CARBON MONOXIDE/*METABOLISM ; LUNG/*PHYSIOLOGY
MH - MODELS, THEORETICAL ; PULMONARY ALVEOLI/PHYSIOLOGY ; RESPIRATION
LA - ENG
SO - RESPIR PHYSIOL 1966;1(1):75-87

60 AU - CUMMING G ; CRANK J ; HORSFIELD K ; PARKER I
TI - GASEOUS DIFFUSION IN THE AIRWAYS OF THE HUMAN LUNG.
MH - BIOMETRY ; HUMAN ; LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL
MH - NITROGEN/METABOLISM ; OXYGEN/METABOLISM
LA - ENG
SO - RESPIR PHYSIOL 1966;1(1):58-74

61 AU - ABRAMS ME
TI - SIMULATION OF THE MECHANICAL PROPERTIES OF THE LUNG.
MH - ANIMAL ; COMPUTERS ; ELASTIC TISSUE/*PHYSIOLOGY
MH - *MODELS, THEORETICAL ; PULMONARY ALVEOLI/*PHYSIOLOGY
MH - SURFACE TENSION
LA - ENG
SO - PROC R SOC MED AUG 66;59(8):782-6

62 AU - PUMP KK
TI - THE CIRCULATION IN THE PERIPHERAL PARTS OF THE HUMAN LUNG.
MH - CAPILLARIES/PHYSIOLOGY ; HUMAN ; LUNG/*BLOOD SUPPLY
MH - MODELS, THEORETICAL ; PULMONARY ALVEOLI/*BLOOD SUPPLY/*PHYSIOLOGY
MH - PULMONARY CIRCULATION/*PHYSIOLOGY
LA - ENG
SO - DIS CHEST FEB 66;49(2):119-29

63 AU - KYLSTRA JA ; PAGANELLI CV ; LANPHIER EH
TI - PULMONARY GAS EXCHANGE IN DOGS VENTILATED WITH HYPERBARICALLY OXYGENATED LIQUID.
MH - ANIMAL ; BLOOD GAS ANALYSIS ; DOGS ; *HYPERBARIC OXYGENATION
MH - LUNG/*PHYSIOLOGY ; MODELS, THEORETICAL
LA - ENG
SO - J APPL PHYSIOL JAN 66;21(1):177-84

64 AU - WILSON TA
TI - MINIMUM ENTROPY PRODUCTION AS A DESIGN CRITERION FOR BREATHING.
MH - CARBON DIOXIDE ; HUMAN ; MODELS, THEORETICAL ; *OXYGEN CONSUMPTION
MH - PULMONARY ALVEOLI/PHYSIOLOGY ; RESPIRATION/*PHYSIOLOGY
LA - ENG
SO - EXPERIENTIA 15 JUN 64;20(6):333-4

65 AU - BOYDEN EA ; TOMPSETT DH
TI - THE CHANGING PATTERNS IN THE DEVELOPING LUNGS OF INFANTS.
MH - BRONCHI/*ANATOMY & HISTOLOGY/*GROWTH & DEVELOPMENT ; CHILD
MH - CHILD, PRESCHOOL ; HUMAN ; INFANT
MH - LUNG/*ANATOMY & HISTOLOGY/*GROWTH & DEVELOPMENT
MH - MODELS, THEORETICAL
LA - ENG
SO - ACTA ANAT (BASEL) 1965;61(2):164-92

66 AU - KOENZIG MC ; HAMILTON RW JR ; PELTIER LF
TI - DIPALMITOYL LECITHIN: STUDIES ON SURFACE PROPERTIES.
MH - *PHOSPHATIDYLCHOLINES ; *LUNG ; MODELS, THEORETICAL
MH - *SURFACE-ACTIVE AGENTS ; *SURFACE TENSION
LA - ENG
SO - J APPL PHYSIOL JUL 65;20(4):779-82

67 AU - PERL W ; RACKOW H ; SALANITRE E ; WOLF GL ; EPSTEIN RM
TI - INTERTISSUE DIFFUSION EFFECT FOR INERT FAT-SOLUBLE GASES.
MH - ADIPOSE TISSUE/*PHYSIOLOGY ; *BIOLOGICAL TRANSPORT ; BIOMETRY
MH - *CYCLOPROPANES ; *GASES ; HUMAN ; KINETICS ; MODELS, THEORETICAL
MH - *NITROUS OXIDE ; PULMONARY ALVEOLI/*PHYSIOLOGY ; SOLUBILITY
LA - ENG
SO - J APPL PHYSIOL JUL 65;20(4):621-7

69 AU - RACKOW H ; SALANITRE E ; EPSTEIN RM ; WOLF GL ; PERL W
TI - SIMULTANEOUS UPTAKE OF N2O AND CYCLOPROPANE IN MAN AS A TEST OF COMPARTMENT MODEL.
MH - ADIPOSE TISSUE/PHYSIOLOGY ; BIOMETRY ; CHROMATOGRAPHY, GAS
MH - *CYCLOPROPANES ; FEMALE ; *GASES ; HUMAN ; KINETICS
MH - LUNG/*PHYSIOLOGY ; MALE ; MODELS, THEORETICAL ; *NITROUS OXIDE
MH - RESPIRATORY FUNCTION TESTS ; SOLUBILITY
LA - ENG
SO - J APPL PHYSIOL JUL 65;20(4):611-20

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69 AU - WEST JB ; JONES NL
TI - EFFECTS OF CHANGES IN TOPOGRAPHICAL DISTRIBUTION OF LUNG BLOOD FLOW ON GAS EXCHANGE.
MH - ANIMAL ; BLOOD PRESSURE ; DOGS ; HEMORRHAGE
MH - LUNG/*BLOOD SUPPLY/*PHYSIOLOGY ; MODELS, THEORETICAL
MH - POSITIVE PRESSURE RESPIRATION ; PULMONARY ALVEOLI/PHYSIOLOGY
MH - PULMONARY ARTERY ; *PULMONARY CIRCULATION ; PULMONARY VEINS
MH - *RESPIRATION
LA - ENG
SO - J APPL PHYSIOL SEP 65;20(5):825-35

70 AU - WORKMAN JM ; PENMAN RW ; BROMBERGER-BARNEA B ; PERMUTT S
AU - RILEY RL
TI - ALVEOLAR DEAD SPACE, ALVEOLAR SHUNT, AND TRANSPULMONARY PRESSURE.
MH - ANIMAL ; BLOOD GAS ANALYSIS ; DOGS ; LUNG/*PHYSIOLOGY
MH - MATHEMATICS ; MODELS, THEORETICAL ; PERFUSION ; PRESSURE
MH - PULMONARY ALVEOLI/*PHYSIOLOGY ; *RESPIRATION
MH - RESPIRATORY FUNCTION TESTS
LA - ENG
SO - J APPL PHYSIOL SEP 65;20(5):816-24

* * * * E N D O F O F F L I N E P R I N T * * * * *

ttt/5/1-11
11/5/1
A Review of the Treatment of Underwater Blast Injuries

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Final technical rept. 1 Jun 74-30 Sep 76
AUTHOR: Yelerton, J. T.; Richmond, D. R.; Jones, R. K.; Fletcher, E. R.
D1384A2 Fld: 6U, 6E, 57O GRAI7707
Sep 76 32p
Rept No: LF-54
Contract: N00014-75-C-1079
Monitor: 18

Abstract: Literature on underwater blast effects in man and animals was reviewed with particular reference to its pathology, pathophysiology and therapy. Anatomic structures which contain air, i.e., lungs, enteric tract, nasal sinuses and middle ear were found to be most vulnerable to blast injury. An historical review of therapeutic procedures used in the treatment of blast injury was then presented. Factors found to be of greatest potential benefit in improving the dismal survival rate of underwater blast victims includes: (1) prevention of air emboli, (2) maintenance of adequate ventilation and respiration and (3) timely surgical repair of enteric tract injuries.

Descriptors: *Wounds and injuries, *Underwater explosions, Treatment, Signs and symptoms, Literature surveys, Pathology, Cardiovascular system, Hyperbaric chambers, Gas embolism, Gastrointestinal system, Respiratory system, Mortality rates, Diagnosis(Medicine), Anesthesia, First aid, Oxygen, Blast waves

Identifiers: Positive pressure ventilation, NTISDODXA

AD-A034 355/8ST NTIS Prices: PC A03/MF A01

11/5/2
Far-Field Underwater-Blast Injuries Produced by Small Charges

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Topical rept.
AUTHOR: Richmond, Donald R.; Yelverton, John T.; Fletcher, E. Royce
C130564 Fld: 6E, 57E GRAI7317
1 Jul 73 100p
Contract: DASA01-71-C-0013
Project: DNA-NWER-MA-014
Monitor: DNA-3081T

Abstract: Underwater blast injuries, at increasing ranges beyond the lethal zone from small charges, were studied using animals. The study was conducted in an artificial pond that measured 220 by 150 ft at its surface. The pond was 30 ft deep over its 30- by 100-ft center portion. Sheep, dogs, and a few monkeys were exposed to the blast oriented vertically in the water (long axis perpendicular to the surface). Most were exposed to the blast at 1-ft depths, heads above the surface, and a limited number at 2- and 10-ft depths. Explosive charges were mostly bare spheres of [illegible]

8 lb. All charges were detonated at 10-ft depths. The immersion-blast injuries were of minor severity and consisted mainly of lung hemorrhages and small areas of contusions in the gastrointestinal tract. The incidence and severity of the injuries were correlated with the impulse in the underwater blast wave. Based on the results of the study, a safe impulse level of 2 to 3 psi.msec for unprotected swimmers, head above the surface, was proposed. This safe impulse level was discussed in relation to the underwater blast-wave parameters in the test pond and existing response data for personnel. (Modified author abstract)

Descriptors: (*Blast, Wounds + injuries), Underwater, Ear, Lungs, Gastrointestinal system, Experimental data, Laboratory animals, Thresholds(Physiology)

Identifiers: *Blast injuries, SD

AD-763 497 NTIS Prices: PC A05/MF A01

11/5/3
Pressure Gradient Measurements in the Bodies of Animals with Air Blast Injuries . Druckverlaufsmessungen im Tierkoerper bei Luftstossverletzungen

Deutsche Forschungs- Und Versuchsanstalt Fuer Luft- Und Raumfahrt, Bad Godesberg (West Germany). Abteilung Mechanische Hoehenwirkung Und Caissonforschung.
AUTHOR: Wuensche, O.; Scheel E. G.
C0585C1 Fld: 6S, 57W STAR1106
Jul 71 26p
Rept No: DLR-FB-71-72
Monitor: 18 [redacted]
Language German English Summary

Abstract: Pressure pulse experiments were conducted and intracorporeal pressures were measured in miniature pigs and albino rats using a previously validated technique and specially selected pressure probes. These were localized for the miniature pigs in the esophagus, the rectum, and in the musculature of the back and the thigh, and for the albino rats, in the rectum. The clinical symptoms cause by pressure pulse and the detected morphological findings, are demonstrated and verified by macro- and microscopical photographs. The variations in the results of these experiments are discussed. (Author)

Descriptors: *Pressure gradients, *Rats, *Swine, Digestive system, Explosions, Muscles, Pressure gages, Pressure measurements, Rectum, Shock waves

N73-15164 NTIS Prices: PC A03/MF A01

11/5/4
The Effects of Intermittent Positive Pressure Respiration on Occurrence of Air Embolism and Morality Following Primary Blast Injury

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Final rept.
AUTHOR: Damon, Edward G.; Henderson, Ernest A.; Jones, Robert K.
C0363L4 Fld: 6E, 6S, 57E, 57W GRAI7306
Jan 73 22p
Contract: DASA01-70-C-0075
Project: DNA-NWED-4-012
Monitor: DNA-2989F

Abstract: Twenty beagle dogs were exposed in pairs to airblast on the

ondulate of a 42-inch diameter shock tube. One dog of each pair then was given intermittent positive pressure respiration (IPPR) for 2 hours with 100 percent oxygen, and the other dog was maintained on 100 percent oxygen for 4 hours in a hyperbaric chamber at a chamber pressure of 14 p.s.i.a., after which she was given IPPR with 100 percent oxygen for 2 hours. The mortality, time of death, and incidence of arterial air embolism in these two groups then were compared with those of 10 untreated control animals that previously had been exposed to airblast in the same way as those in the treatment groups. The mortality was 60 percent in the untreated control group, 80 percent in the immediate IPPR group, and 50 percent in the delayed IPPR treatment group. There was one case of air embolism (14-minute fatality) in the untreated control group, three cases of air embolism in the immediate IPPR group, and none in the delayed IPPR group. The mean survival time for the fatalities was 12.4 hours for the untreated control group, 2.3 hours for the immediate IPPR group, and 9.9 hours for the delayed IPPR group. Thus, the results indicate that the use of IPPR immediately following blast injury may result in an increase in the incidence of air embolism, increase in mortality, and a reduction in survival time; whereas, when used after a delay of 4 hours, IPPR resulted in neither an increase in incidence of air embolism nor in mortality but did result in a shortening of survival time. (Author)

Descriptors: (*Pressure breathing, Therapy), (*Gas embolism, Pressure breathing), (*Blast, Gas embolism), (*Lungs, Explosion effects), Wounds + Injuries, Oxygen, Mortality rates, Survival, Shock(Pathology) , Aviation medicine, Dogs, Experimental data

AD-754 448 NTIS Prices: PC A02/MF A0[illegible]

11/5/5
Comparative Effects of Hyperoxia and Hyperbaric Pressure in Treatment of Primary Blast Injury

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Technical progress rept.
AUTHOR: Damon, Edward G.; Jones, Robert K.
A3101A3 Fld: 6E, 6S, 57E, 57W GRAI7123
1 Mar 71 51p
Contract: DA-49-146-XZ-372
Project: DASA-NWER-XAXM
Task: A012
Monitor: DASA-2708

Abstract: Guinea pigs and rabbits were exposed to lethal reflected pressures in an air-driven shock tube and were subsequently treated in a hyperbaric chamber in which the oxygen tension (PO2) and chamber pressure were independently varied. Treatments involving increases in PO2 resulted in increased survival times of guinea pigs whereas pressurization for 30 minutes at 36 or 72 p.s.i.g. with the PO2 retained at the normal ambient level by use of an N2-air mixture had no detectable effect on survival times of the animals. To study the effects of prolonged hyperbaric oxygenation in treatment of blast injury, guinea pigs and rabbits were treated on a 29-hour schedule having an initial 3-hour hold-time at the pressure-treatment level followed by 26 hours for decompression. In rabbits, an initial PO2 of 17.5 p.s.i.a., achieved either by air pressure at 72 p.s.i.g. or by pressurization to 15 p.s.i.g. with 65-percent O2, 35-percent N2, resulted in full survival and recovery of all treated animals. In guinea pigs, treatment with 100-percent O2 at 2.5 p.s.i.g. (PO2 = 17.3 p.s.i.a.) or at 12 p.s.i.g. (PO2 = 24 p.s.i.a.) resulted in increased survival times with no increase in overall survival and recovery in the first case and significantly increased survival and recovery

pathophysiology of primary blast injury is discussed with special reference to the roles of air embolism and cardiopulmonary pathology in the etiology of death. (Author)

Descriptors: (*High-pressure research, Wounds + injuries), (*Blast, Wounds + Injuries), (*Wounds + Injuries, Therapy), Oxygen, Pressure, Respiratory system, Cardiovascular system, Pathology, Physiology, Gas embolism, Decompression, Space medicine, Aviation medicine, Laboratory animals, Experimental data

Identifiers: Hyperbaric oxygenation, Hyperoxia, *Hyperbaric medicine

AD-731 396   NTIS Prices: PC A04/MF A01

11/5/6
The Effects of Airblast on Sheep in Two-Man Foxholes

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Final rept.
AUTHOR: Richmond, D. R.; Fletcher, E. R.; Jones, R. K.
A301364   Fld: 6P, 15F, 57O, 74I   GRAI7122
1 Jun 71   32p
Contract: DASA01-68-C-0118
Project: DASA-NWET-L35AAXM
Task: X408
Monitor: DASA-POR-LN-401
Report on operation Prairie Flat.

Abstract: The blast effects in rectangular two-man foxholes were evaluated using sheep. There were two open foxholes at ground ranges of 560, 650, 830, 940, and 1,300 feet from a 500-ton TNT charge. Because of an anomalous detonation, pressures measured adjacent to the foxhole layout were significantly below those predicted. Moreover, luminous jets emanating from the fireball produced shock waves that preceded the main shock. This gave rise to a blast wave with double shocks known generally to be less damaging to biological systems. All the sheep survived the blast. At the 560- and 650-foot ranges (37 and 21 p.s.i.) some of the sheep sustained slight amounts of pulmonary hemorrhage. In addition, they exhibited a high incidence of eardrum rupture of a severe form. (Author)

Descriptors: (*Infantry, Vulnerability), (*Nuclear explosions, Infantry), Explosion effects, Wounds + injuries, Laboratory animals, Pressure gages, TNT, Detonations, Shock waves, Lungs, Hemorrhage, Vestibular apparatus, Rupture, Blast, Biopsy, Nuclear explosion damage

Identifiers: Overpressure, Prairie Flat operation, *Blast injuries

AD-730 474   NTIS Prices: PC A03/MF A01

11/5/7
Underwater Blast Injury - A Review of the Literature

Naval Submarine Medical Center Groton Conn Submarine Medical Research Lab (252220)
AUTHOR: Wolf, Nelson M.
A210464   Fld: 6U, 57O   GRAI7112
26 Oct 70   20p
Rept No: SMRL-646
Project: MF099.01.01.06

Abstract: Underwater blast injury is reviewed for the period 1916 to the present date (1970). The physics of the blast, the mechanism of

injury, the pathology, and clinical considerations are discussed. A discussion and criticism is presented of the various formulae for damage range. Much of the material is supported with references to both animal and human data. (Author)

Descriptors: (*Wounds + injuries, Blast), (*Blasts, Underwater), Damage, Pathology, Explosion effects, Physics, Reviews

Identifiers: *Underwater blast injuries

AD-722 666 NTIS Prices: PC A02/MF A01

11/5/8
Die Anwendung des Diureticums Lasix bei Druckstossverletzungen (The Use of the Diuretic Lasix in Blast Injury)

Deutsche Forschungs-Und Versuchsanstalt Fuer Luft-Und Raumfahrt E V Bonn-Bad Godesberg (West Germany) (405474)
AUTHOR: Wuensche, O.; Scheele, G.
A2022E2 Fld: 6E, 6O, 6U, 57E, 57Q, 57O GRAI7111
1970 7p
Rept No: DFVLR-Sonderdruck-84
Text in German.
Availability: Pub. in Wehrmedizin und Wehrpharmazie, n9/10 p113-117 1970. No copies furnished by DDC or NTIS.

Abstract: Aus den vorliegenden Untersuchungsergebnissen geht hervor, dass bei Zwergschweinen nach Schadigung durch Druckwellenstoss die Uberdruckbehandlung in Verbindung mit diuretischen Massnahmen, wie mit der Verabriechung von ,Lasix'(Fursemide), ohne Zweifel als eine mogliche Therapieform ihre Bedeutung hat. Der kritische Vergleich von Therapie- und Kontrolltieren in Gruppen, die 21--35 Tage und 36--60 Tage uberlebt haben, hat ergeben, dass bei den behandelten Zwergschweinen nach an sich schneller Resorption der Blutungen, die reparativen Vorgange in den Lungen spater einsetzen und weniger ausgepragt sind. Die Behandlung hat bei den druckstossgeschadigten Versuchstieren die morphologisch nachgewiesenen Spatveranderungen in den Lungen als Folge der Blutungen nicht verhindern, aber doch zumindest einschranken konnen. Dabei muss man der Gabe von ,Lasix' mit der prompten, diuretischen Wirkung einen besonderen therapeutischen Effekt beimessen. (Author)

Descriptors: (*Blast, Wounds + injuries), (*Diuretics, Therapy), (*Lungs, Blast), Ballistics, Explosions, Laboratory animals, Hemorrhage, Edema, Cardiovascular system, Rupture, Tissues(Biology), Bronchi, Biopsy

Identifiers: *Blast injuries, *Pulmonary hemorrhage, Pulmonary edemas, *Fursemide, Anthranilic acids, *Overpressure, Peribronchia, Alveoli pulmonis, Blast lesions

AD-721 878 NTIS Price: Not available NTIS

11/5/9
Recovery of the Respiratory System Following Blast Injury

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Technical progress rept.
AUTHOR: Damon, Edward G.; Yelverton, John T.; Luft, Ulrich C.; Jones, Robert K.
A1691C3 Fld: 6S, 57W GRAI7107
Oct 70 27p
Contract: DA-49-146-XZ-372
Project: DA56-NWER-XAXM

Monitor: DASA-2580

Abstract: The pattern of recovery of the respiratory system from blast injury was investigated in sheep exposed to overpressures in a shock tube. Measurements of the pH and blood gas tensions, determinations of the venous-admixture (Qs/Q) and the alveoloarterial oxygen gradient (A-a)O2 were conducted before and at intervals up to 132 days following injury. There was an immediate marked increase in Qs/Q, reduction in PaO2, and a moderate increase in (A-a)O2, with very little change in the pH or PCO2 of the arterial blood. The greatest recovery was evident within 24 hours with further gradual improvement seen 2, 7, 14, and 21 days after exposure. After the 21st day, most of the animals exhibited virtual complete recovery of the functional efficiency of the pulmonary system as tested at rest. (Author)

Descriptors: (*Respiratory system, *Blast), (*Explosion effects, Respiratory system), Wounds + injuries, Shock waves, Pressure, Recovery, Lungs, Blood vessels, Gases, Oxygen, Carbon dioxide, PH, Stress(Physiology), Physiology, Pathology

AD-718 369 NTIS Prices: PC A03/MF A01

11/5/10
THE RELATIONSHIP BETWEEN SELECTED BLAST-WAVE PARAMETERS AND THE RESPONSE OF MAMMALS EXPOSED TO AIR BLAST

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Technical progress rept.
AUTHOR: Richmond, Donald R.; Damon, Edward G.; Fletcher, E. Royce; Bowen, I. Gerald; White, Clayton S.
3503K2 Fld: 6U USGRDR6715
Nov 66 41p
Contract: DA-49-146-XZ-372
Project: 03.012
Monitor: DASA-1860

Abstract: Shock tubes and high explosives were used to produce blast waves of various pressure-time patterns in order to study their biological effects. Data obtained from these experiments showed that, against a reflecting surface, the LD50 reflected pressure for any given species remained fairly constant at the 'longer' durations and then rose sharply at the 'shorter' times. For dogs and goats, 'long' durations were beyond 20 msec and for mice, rats, guinea pigs, and rabbits, beyond 1 to 3 msec. At the 'shorter' durations, response depended to a great extent on the impulse, and on peak pressure for the 'longer' pulses. Higher reflected pressures can be withstood if animals are located beyond a certain distance from the reflecting surface where they receive the incident and reflected pressures in two steps, separated by a given time-interval. In freestream exposures to air blast, orientation was significant. Animals suspended vertically or prone-side-on showed a lower tolerance to blast waves of a given intensity or at a given range than those end-on because the dynamic pressure appeared to add to their side-on pressure dose. Except for eardrum rupture and sinus hemorrhage, animals exhibited a remarkable tolerance to 'slow'-rising blast pressures without the presence of shock fronts. The lungs are considered the critical target organs in blast effects studies. (Author)

Descriptors: (*Blast, Tolerances(Physiology)), Mammals, Responses, Pressure, Time, Shock waves, Shock tubes, Wounds + injuries, Lungs, Ear, Mortality rates, Thresholds(Physiology), Hemorrhage, Pathology

AD-65[illegible] 131 CFSTI Prices: PC A03/MF A01

11/5/11
PATHOLOGY OF DIRECT AIR-BLAST INJURY

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Technical progress rept.
AUTHOR: Chiffelle, Thomas L.
2813K4 Fld: 6T, 15F USGRDR6619
Apr 66 2p
Contract: DA-49-146-XZ-055
Project: 03.012
Monitor: DASA-1778

Abstract: Blast injury is a complex and very hazardous phenomenon to the biologic target. Together with effects of thermal radiations from modern nuclear weapons, blast injury (direct and indirect) appears to be accountable for the vast bulk of early deaths and casualties in nuclear explosions. This article has attempted to summarize the important clinical, physiologic, and pathologic information concerning the effects of direct air-blast injury on the biologic subject. Certain features have been emphasized in order to assist the clinical medical officer towards proper management of casualties. A brief description of pulmonary sequelae of blast injury is included for completeness. (Author)

Descriptors: (*Blast, Wounds + injuries), (*Wounds + injuries, Nuclear explosions), Pathology, Airburst, Lungs, Thorax, Respiratory system, Cardiovascular system, Ear, Eye, Abdomen, Gas embolism, Central nervous system, Mortality rates, Nuclear warfare casualties

16/5/5
Probability of Injury from Airblast Displacement as a Function of Yield and Range

Lovelace Foundation for Medical Education and Research Albuquerque N Mex (212000)

Topical rept.
AUTHOR: Fletcher, E. Royce; Yelverton, John T.; Hutton, Roy A.; Richmond, Donald R.
C6352J1 . Fld: 15C, 15F, 57W GRAI7611
29 Oct 75 37p
Contract: DNA001-74-C-0120
Project: DNA-NWED-QAXM
Task: A012
Monitor: DNA-3779T

Abstract: The purpose of this study was to predict the probability of impact injuries due to whole-body translation by airblast as a function of yield and ground range. Predictions were made for personnel in different orientations in open terrain and near structural complexes. A mathematical model was used to calculate the time-displacement history of personnel from considerations of aerodynamic drag and ground friction. Predicted values of maximum velocity, displacement at maximum velocity, and total displacement were tabulated for 1224 exposure conditions. Biological criteria were presented which indicated that personnel subjected to decelerative tumbling over open terrain can tolerate much higher velocities than personnel impacting a nonyielding, flat surface at normal incidence. Methods for extending the presented results to other exposure conditions were discussed.

Descriptors: *Impact shock, *Airburst, *Nuclear warfare, *Tumbling, Wounds and injuries, Yield(Nuclear explosions), Range(Distance), Mathematical models, Casualties, Aerodynamic drag, Velocity, Blast waves, Displacement, Humans

Identifiers: NTISDODXA, NTISDODSD

AD-A022 785/0ST NTIS Prices: PC A03/MF A01

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